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THE EFFECTIVENESS OF THREE READING PREPAREDNESS PROGRAMS FOR PERCEPTUALLY HANDICAPPED KINDERGARTENERS

A DISSERTATION
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OF STANFORD UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

By
Leebrick
Pearl Marcia^McBeath

December 1965

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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(Speech Pathology and Audiology)

Approved for the University Committee
on the Graduate Division:

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CHAPTER I

THE PROBLEM

The Need

In many classrooms there are a few children who read poorly or not at all. Until recently this was generally attributed to one of three causes -- intellectucal dullness, poor educational background, or emotional problems. Often the slow-learning children were put in special classes, the educationally retarded were offered remedial help, and the emotionally disturbed were given psychotherapy. Granted, these treatments helped many of the children. However, there usually remained some who still did not learn to read. With a few, all three methods were tried but the students remained poor readers (Tomkins, 1963).

When these exceptional children are studied they often seem to demonstrate several behavioral manifestations. On the little reading and spelling they do, they almost invariably show reversals. Some letters are transposed within a word and some are written backwards. Words that appear to be learned one day are forgotten the next, although lessons learned orally are often retained. In diagnostic testing, certain perceptual skills are consistently low. In addition, these children are usually hyperactive, although it is not too uncommon to find one who is hypoactive.

They may not have all of these symptoms, but the one thing they usually have in common is a visual perceptual handicap. They do not see things the way the average person does, though there may be nothing wrong with their visual sensory organs.

> As a normal individual you have not experienced the distortions or misperceptions which occur repeatedly to the perceptually handicapped child. And you no longer recall the first groping efforts of your early childhood. It is only when conditions are poor for perceiving accurately that you may experience something comparable to a perceptual disturbance. You may have had the experience of driving along the highway and noticed an advertisement but so briefly that you were unable to identify what the picture was about. Or in a fog or semi-darkness you are uncertain because the shapes of things are different from usual (Lehtinen, 1963).

Approximately ten percent of children of normal or above average intelligence have a specific language disability which hampers reading (Stuart, 1963). This ten percent does not include those children whose problems are due to poor vision, hearing or health, indifferent teachers, or spotty attendance. These are mainly the perceptually handicapped children. The research reported here tested various methods of preparing such children for successful reading experiences.

The Nature of Perception

Perceiving is not merely seeing or hearing or feeling. A distant sound may be heard but not recognized. Instant coffee may taste the same to some people as that brewed in a pot but not to others. An experienced hunter can often discriminate a deer among the trees though the animal's color blends perfectly with his surroundings. Perceiving depends on the sensory experience plus its meaning. In addition, we concentrate on one aspect of the total field of perception. Thus, in a room where several conversations are going on at the same time, we are mainly aware of the one in which we are involved. Furthermore, we learn to discriminate between similar elements. Identical twins may be indistinguishable from each other until we observe that one of them has some extra freckles, a slightly different shade of hair, a dissimilar way of walking.

The ability to discern the qualities of the objects we perceive is learned (Kingsley and Garry, 1957, p. 332). A young child after coming to know the word, "dog", often applies it to all animals. A wine taster learns to discriminate between quite similar flavors. Perception is learned, improved and changed through experiences. Much of this occurs very early in life and progresses from the generalized to the specific. It is generally considered as developing between the ages of two and seven (Piaget and Inhelder, 1956, p. 5).

As with any human characteristic, there is a range of perceptual ability, from the handicapped to the gifted. A perceptual handicap refers to "An impairment in the normal processes of perception, that is, in the basic ability of all human beings to cope with and to make sense out of the environment in which they live" (Lehtinen, 1963, p. 1).

This study was concerned mainly with visual perception and the phrase "perceptually handicapped" refers to the visually perceptually disadvantaged. An operational definition of "visually perceptually handicapped" was used for purposes of this research; that is, any child who scored at or below the 25th percentile on the Marianne Frostig Developmental Test of Visual Perception.

Factors Associated with a Perceptual Handicap

Just as a normal child may not begin walking until he is 20 months old, so there may be delayed maturation in perception

(Frostig, Lefever, Whittlesey, 1963, p. 161). Or, just as an adult who never had the opportunity to learn how to swim may be in trouble if his boat should capsize, so a child raised in a barren room with little stimulation to his senses has a similar problem when exposed to the world (Ayers, A-56, p. 1). Or a perceptual handicap may be a physical dysfunction caused by minimum brain damage (Lewis, Strauss, Lehtinin, 1951, p. 14). Another hypothesis is that it is genetically determined, but early restriction interferes with its development (Smith and Smith, 1962, p. 315). Or it may be an inherited tendency (Stuart, 1963, pp. 11-13).

It is important, however, to acknowledge that perceptual handicaps exist and can be recognized. "Children who deviate from the norm can be identified and the range and severity of perceptual difficulties measured, regardless of the etiology, be it brain injury, developmental lag or emotional disturbance" (Frostig, Lefever and Whittlesby, 1961, p. i).

CHAPTER II

THE LITERATURE

Historical Review of Literature on Learning Difficulties Related to Perception

Experiments in visual perception have interested psychologists for centuries. For example, Sanford (1896) described an experiment published in 1738.

> Place in the focus of a convex lens a wafer, a printed letter or any other small object, and view it at different distances from the lens. As the distance increases, the object will seem to enlarge until it fills the lens completely. The fact is, however, that its image remains approximately constant in size (since the rays from it are made parallel by the lens), while the image of the lens itself and of all other objects in the visual field decreases in size (pp. 413-414).

For over fifty years attempts have been made to describe, explain and treat the perceptually handicapped child. The name of the condition, the suspected etiology, and the methods of treating such disabilities have varied over the decades but there is still no consensus on any of these aspects.

Classification Systems Which Have Been Applied to a Perceptual Handicap

The term that was first used to describe a condition in which an intelligent person with no apparent physical problem was unable to learn to read, was "congenital word blindness". Although most writers refer to W. P. Morgan, a British opthalmologist, as having coined the term in November of 1896, Schmitt (1918) reported that

Dr. James Kerr used the phrase in a Howard Prize essay of the British Royal Statistical Society, in June of that year. The condition in which unexplained perceptual handicaps were acknowledged, was contrasted by Dr. Kerr with word blindness resulting from cerebral injury or disease, a diagnosis known by medical doctors for years (McCready, 1910).

Physicians in the United States soon began using the phrase, congenital word blindness. In 1906, a new term, "developmental alexia", was coined by Dr. Edward Jackson (1906, p. 55), and was still widely used a dozen years later (Schmitt, 1918, p. 680). During the next five years several new classification systems appeared in the literature, in an apparent attempt to diagnose as well as define. For instance, one could find such words as "congenital symbolamblyiopia","congenital typho-lexia" and "amnesia visualis verbalis" (McCready, 1910, p. 278).

The expression, "word blindness", apparently had a negative connotation for many educators and doctors (Bronner, 1917, p. 88). Thus, the more euphemistic term, "dyslexia", was introduced. It has been defined as "a more common type of disability in reading which is not sufficiently severe to warrant the diagnosis of word-blindness" (Lord, Carmichael and Dearborn, 1925, p. 7).

From this point on, the pendulum moved from highly descriptive terms to more cautious methods of classifying the non reader. "Specific Reading Difficulty" satisfied most writers of that period (Arthur, 1927). Some authors were particularly adament on avoiding the use of more descriptive expressions. Gates (1922, p. 267) wrote that "congenital alexia", "defects of visual memory" and "congenital word blindness" were merely "convenient substitutes for real analyses of cases of reading disability."

Closer analyses, however, led to emphases on particular aspects of a reading disability. Orton (1937) for example, diagnosed the difficulty as "strephosymbolia" which, he claimed was "characterized by confusion between similarly formed but oppositely oriented letters, and a tendency to a changing order of direction in reading" (p. 214).

Wheeler and Wheeler (1955) preferred that "dyslexaphoria" be used to describe a child with a tendency toward linguistic associative difficulties. They advise that the term, dyslexia, be reserved only for extreme retardation.

Although many children with the perceptually handicapped syndrome were labeled lazy or stupid, some were thought of as having a medical problem. Clinics often used a multidiscipline approach to evaluate such children. The University of Maryland and the Maryland State Department of Health jointly operate a clinic for handicapped children. Out of 525 patients, 19 percent had only the psychological symptoms of the perceptually handicapped child. "After exhaustive examination and assessment, the final diagnosis was minimal cerebral dysfunction or minimal brain damage without intellectual subnormality" (Clemmens, 1961, p. 179).

The designation, "perceptually handicapped" is a relatively new one (Lehtenin, 1963), again perhaps a euphemism for a manifestation of the less readily acceptable classification,"minimal brain damage".

Although the classification titles referring to a perceptual handicap have changed over the past six decades, the disability remains the same. Kerr's original description of congenital word blindness in 1896, was of a person well endowed in general mental ability but unable to learn to read though having no apparent physical problem to explain it (Schmitt, 1918, p. 680). Compare that with Money's 1962 description of specific dyslexia as "a situation in which a child is unable to read with proper facility despite normal intelligence, intact senses, proper instruction, and normal motivation" (Money, 1962, p. 4).

In this report, the term, perceptual handicap, is used interchangeably with dyslexia, congenital word blindness, specific language disability and other previously mentioned classification systems even though some writers may have had in mind a slightly different connotation.

Variety of Possible Causes

Rarely does one know the etiology of a perceptual handicap, but many theories have been proferred. Minimal brain damage or malfunction has been the cause most often suggested as the primary reason for such a disability.

One of the earliest references associated "word blindness" with aphasia (Ladd, 1897, p. 293). Other early theories were specific as to the section of the brain that lacked development. The left angular gyrus was considered the area that had "been fixed upon as the center for recording images or memories of printed or written words" (Schmitt, 1918, p. 681). The stamping theory led to the belief that this portion of the brain had evolved after generations of humans had learned to read and write (McCready, 1910, p. 280).

Some, who disagreed with the stamping theory, believed that children who had perceptual problems were merely at the low end of the normal curve (Lord, Carmichael, Dearborn, 1925, p. 1), and either had a defect in the association fibers (p. 28) or had been subjected to poor environmental conditions (p. 4). Others disagreed only with the specificity of the section of the brain involved.

One clinical neurological study was made of 46 children between the ages of 7 and 10, who were unable to read (Cohn, 1961). An index was computed from language, somatic receiving and expressive systems, personal spatial organization and social adaption. Ninety-five percent of the non readers totaled over 10 on their index, while a control group scored mainly between zero and 10. Over 50 percent of the non readers vs. 10 percent of the controls, showed abnormal EEG's. Some of the patients were retested two years later on the electroencephalogram. Although training had decreased other behavioral abnormalities, EEG's showed only minimal changes. While presenting no evidence for his claim, Cohn felt that the reading difficulties of this group were the result of a generalized brain dysfunction rather than a specific lesion.

The Pediatric Language Disorder Clinic of the Columbia-Presbyterian Medical Center in New York evaluates and trains children referred for severe reading disabilities.

> Among the children we have tested during the last few years we have found a fairly steady, though small, number of youngsters whose perceptual deviations, trouble with figure-background relationships, out-standingly poor motor performance and limitations in abstract

> behavior seem far more severe than is usual for the child who suffers from a developmental language disability. Careful investigation of these cases has sometimes revealed a positive history, for instance anoxia at birth. These youngsters do not necessarily show the usual positive signs on the classical neurological examinations. However, more refined testing procedures show that they have difficulties at various levels of integration (de Hirsch, 1957, p. 574).

Another popular theory both in the past and present, is that associated with laterality (Hincks, 1926; Orton, 1928; Orton, 1937; Delacato, 1959; Delacato, 1963). Laterality refers to one-sidedness for eyedness, handedness and footedness.

Delacato considered the perceptual difficulties as stemming from a disorganization of neurological growth.

> A lack of neurological organization can be the result of a genetic bias. This represents a very small percentage of our problems in the typical schools of America. A second area of etiology is a trauma. This again in a small percentage of our population. The third etiological area is the area of lack of environmental opportunity for complete neurological organization. This group represents by far the greatest majority of our problems in the area of communication (Delacato, 1963, p. 120).

His findings, however, were not based on scientifically controlled experiments. He was willing to leave this type of research to others.

Orton lost some of his following because of his reference to visual and auditory engrams as objects rather than impressions or traces (1928).

The relationship of eyedness and handedness to reading difficulties has been studied for decades, but writers continue to disagree (Dearborn, 1931, p. 704; Monroe, 1936, p. 84; Zangwill, 1962; p. 109).

Somewhat similar to the theory of laterality was that of a lack of binocular coordination (Betts, 1934). It was thought that the perceptual handicap occurred when the mind failed to combine the left-eye and right-eye images.

Because of the apparent involvement of the occular organs, neurologists and opthalmologists were among the first to become interested in perceptual handicaps (Bronner, 1917). But strictly visual defects were no more frequent with the perceptually handicapped than in the rest of the population.

Optometrists have also become increasingly aware of perceptual problems (Lyons and Lyons, 1954, 1956, 1957, 1961; Macpherson, 1964). The Optometric Extension Program in Duncan, Oklahoma, has encouraged the optometric profession to concern themselves with the functions of vision rather than primarily with defects of the eyes.

> The child's ability to visually interpret the world and his place in it is learned. Therefore visual perception is learned. It is properly learned only to the extent of a child's action and interaction with his world. These actions and interactions by the child are not always spontaneous, and must be encouraged and/or arranged by adults, thus ultimate visual abilities are learned by the child.
> (Optometric Extension Program Staff, 1961.)

Psychiatrists have also assumed that learning has often been involved in the development of a perceptual handicap, but their emphasis has been more on the child's social learning history.

Lippmann (1962) has reviewed the literature covering more than 50 years and has found references to reading difficulties ascribed to such areas as fear of castration, expression of aggression, parental neuroses and weak egos.

It is frequently observed that perceptually handicapped children have emotional problems. But cause and effect are confused. Heller (1963) believes that the child suffers emotionally in every case.

Frequent reference has also been made to the fact that more boys are perceptually handicapped than girls. Theories have varied widely over the years but there is still little agreement on the reason. McCready (1910) believed the cause to be the fact that boys are more liable to birth injury, having larger heads than girls. Stuart (1963) explained the discrepancy in terms of genetics. She considered a perceptual handicap to be an inherited sex-linked characteristic, similar to baldness or color blindness.

And so the discussions go on. Are the symptoms of a perceptual handicap due to inheritance? Are they caused by minimal brain injury? Do they merely represent a developmental lag, with time in its favor? Are they primarily due to an emotional disturbance? Are they caused by an interaction of several of these? The psychologists and the neurologists, even within their own fields cannot agree on the etiology, but over the years educators could not wait for someone to discover the true cause. Some help had to be offered to the sufferers.

Variety of Suggested Treatments

Quintilian, a great Roman rhetorician and teacher, who lived during the first century A.D., advocated the use of ivory letters for the child to handle (Ulich, 1954, p. 105). He considered the tactile sense important in gaining readiness for reading.

The use of other senses, in addition to that of sight, has come down through the ages in methods of aiding poor readers. The perceptually handicapped appears to have responded best to kinaesthetic aids.

Patients with acquired word blindness caused by injury or disease have taught themselves to read by tracing the letters with their fingers (James, 1890, p. 62). Bronner (1917) quoted studies where blocks were used to develop "muscle memories" to substitute for "visual memories" (p. 30).

A complete instructional system was devised based on the sense of touch (Fernald and Keller, 1921). Fernald also tried to increase the child's motivation for reading and writing, by letting him choose his own words and sentences, a principle suggested by another educator at the turn of the century (Reeder, 1900, p. 89).

Fernald's kinaesthetic approach usually consisted of a five-step plan which began with the tracing of a self-selected word written in cursive writing. Two fingers were to be placed directly on the surface, never in the air. After several words were learned in this manner, spontaneous sentences would be similarly learned. Then came words from stories selected by the child. If an initial attempt to read the word through a slit in a cardboard was not successful, the same kinaesthetic method was repeated. Next came apperception of phrases and finally silent reading for content. Fernald's ideas did not change over the years (Fernald and Keller, 1936, p. 7) and her methods are still widely accepted by many remedial and first grade teachers.

Some educators stressed training in phonics for the perceptually handicapped (Schmitt, 1918, p. 680). Some preferred the ABC method in which the alphabet was mastered first, and then combinations of letters were learned (Lord, Carmichael and Dearborn, 1925, p. 30). Some used phonics reinforced with kinaesthetic techniques (Orton, 1928; McBroom, 1946). Others disavowed phonics completely and relied only on tracing (Hincks, 1926, p. 10).

Wheeler and Wheeler (1955) considered neither tracing nor phonics as being effective. Their main technique was to teach the student to visualize the word. They would attempt to train for perceptual vividness and acuity by building wide associations around the mental image of a word or idea.

Heller (1963) taught a sample of 28 perceptually handicapped children to read by showing them the word after it has been learned by auditory experience.

Where failure to establish cerebral dominance was considered as the reason for the reading weakness, training in laterality was prescribed. Betts (1934) used the Keystone Opthalmic Telebinocular, an instrument which permits the left eye to see the left side of the material to be copied or read, while the right eye sees only its half. Taylor (1937) prescribed the Metron-O-Scope, a triple-shutter short exposure device, to be used with a prism for training in binocular coordination. One of his case studies described a perceptually handicapped boy who was left handed, left footed and right eyed. He reported that in ten weeks of training, the speed of reading increased from 81 words per minute to 247 (Taylor, 1937, p. 295).

Occasionally, a case was described in the literature, where handedness was changed, thereby producing improvement in both reading and writing (Robinson, 1939, p. 533).

The Hawthorne effect must be taken into consideration when evaluating the success of various methods. There are many areas of productivity in which improvement unrelated to the experimental variable will be demonstrated, merely because of the interest shown in the subject.

> The kinesthetic approach, the phonetic approach, the nonsense syllable approach, the whole-story approach, the silent approach -- there are too many to enumerate them all -- give the same results: successful in many cases, useless in others. These varied methods have one characteristic in common: the motivation of the teacher (Axline, 1947, pp. 61-62).

Axline (1947, p. 49) thought that a nondirective therapeutic approach might be helpful both in remedying certain reading problems and in building reading readiness.

Present Views of Perceptual Handicaps as Reflected in the Literature

As we become more knowledgeable about the manner in which percepts are learned, we have more of a basis for developing methods of improving perception. Perceptual learning is explained according to the school of the author, the two main theories being conditioning and Gestalt. "The first explanation stresses somewhat the gradual building up or synthesis of a group of related perceptual responses, while the second stresses a first reaction to a somewhat vague larger pattern, followed by separate sensations of parts of the pattern and concluding with some sort of integration of the whole pattern perceived" (Russell, 1956, p. 73).

Whether accepting either, or both of these theories, one can recognize the possible role of experience in improving perception.

The Effects of Experience

Hebb (1949) and Piaget (1956) consider behavior and the ability to learn as originating in central processes which change with experiences. The rate and level, within genetically determined limits, are especially dependent on early experiences.

Research with animals has demonstrated this to be true where perceptual activity is concerned. "These studies have shown that rats reared with ample opportunities for a variety of perceptual experience do learn mazes more readily than rats reared with minimal opportunities for a variety of such experience" (Hunt, 1961, pp. 352-353).

Animal experiments have also shown that when brain damage occurs at an early age, functions usually carried out by certain areas of the brain can be taken over by other parts. That this may apply to visual perception was illustrated in an experiment by Doty in which the striate area of new-born cats was destroyed (Morgan, 1965, p. 194). As adult animals, they were able to perform a shape discrimination test as well as normal controls.

Other work has revealed that although retardation of maturation may occur with early sensory deprivation, training can improve the function. This was demonstrated in kittens reared in the dark for 27 days after birth (Gibson and Walk, 1960). Although all species of animals tested on the "Visual Cliff" avoided the deep side, the kittens who had been deprived of light needed a few days to learn this.

However, where such opportunity for early experiences have been lacking, later training may compensate to some extent. Gibson (1953) cites several studies where perceptual judgment has been improved by controlled practice or training. She also discusses favorably some transfer of perceptual learning. Of course, one must be cautious in generalizing from animals to humans.

Taylor (1962, p. 198) described an experiment where a volunteer wore glasses that reversed right and left. After a period of training, he not only adapted, but, indeed, "saw" objects in their correct positions.

In man, although there seems to be some spontaneous recovery of perceptual loss after brain injury, practice or training can be valuable (Morgan, 1965, p. 532). We do not know whether failure to establish normal perceptual functions has the same implications as recovery from perceptual loss. However, our knowledge of how perception is learned would suggest some similarity. The problem is in determining what kind of practice or training helps the perceptually handicapped child.

Present Methods of Treatment

Recently several advocates of new methods or variations of old techniques of working with perceptually handicapped have appeared.

Delacato (1959, 1963) recommends cross-pattern crawling, sleep posturing, and training in laterality. Cowen (1955, pp. 536-541) advises psychotherapy for the brain-injured. A public school in New Jersey has been experimenting with spring boards and swinging targets and claims success in improving reading (Wallace, 1963). No theory was offered to explain this success.

A somewhat different approach has been used in Winterhaven, Florida where the Lion's Club has sponsored research in perceptual training to improve reading. Their program is mainly concerned with the tracing of geometric templates (Spache, 1963). Similar forms are used to test visual perception. An experimental study showed it to be a good predictor of school success (Lowder, 1956).

Most of the above programs, however, have not been rigorously researched, with the structured, controlled experimental methods expected of well-designed studies.

The two methods studied in this investigation were those proposed by Newell C. Kephart (Kephart, 1960; Radler and Kephart, 1960) and by Marianne Frostig (Frostig and Horne, 1964).

The emphasis of the Kephart method is on motor training. "There is evidence that the efficacy of the higher thought processes can be no better than the basic motor abilities upon which they are based" (Kephart, 1960, p. 37). Thus, Kephart prescribes use of the balance beam and the balance board as essential parts of the training. He states that input (sensory or perceptual) activities and output (motor or muscular activities) cannot be separated. There are perceptual aspects to all motor activities. For instance, as a child is walking along a balance beam, he must perceive his body in relation to the surroundings. If he loses his balance, he needs to sharpen his perceptions. He eventually learns to integrate and use these perceptions to prevent him from falling. This, in turn, strengthens his perceiving ability. In reading, it is also necessary to integrate perceptions into meaningful forms. Both input and output are involved.

Kephart has published books and articles on this method but it needed to be tested under controlled conditions. His suggestions have been used in related research (Kirk and Bateman, 1962). Using the Illinois Test of Psycholinguistic Abilities profile as a diagnostic tool, Kirk and Bateman attempted to remediate a learning disability by beginning with activities based on Kephart's methods. They found that motor encoding improved but they felt more time would be needed before transfer to other areas would occur.

The second method investigated in this study also depends on specific types of experiences. As a result of many years of working with perceptually handicapped youngsters in her school in Los Angeles, Marianne Frostig has devised a program which aims at training of five separate aspects of perceptual development:

(1) Perception of Position in Space
(2) Perception of Spatial Relationships
(3) Perceptual Constancy
(4) Visual-Motor Coordination
(5) Figure-Ground Perception

For each area, classroom training is described, a large part of which is by use of prepared ditto sheets.

All of the above activities are directly involved in reading. Thus, if they can be strengthened, we would expect reading to improve. The Frostig method was just recently published (1964) and needed to be tested under controlled conditions.

CHAPTER III

RESEARCH DESIGN

Objectives

Reading is a fundamental skill, success in which to a great extent determines success in many other school subjects. Most children of normal intelligence are capable of learning to read by the time they are in the first grade. If those who fail to learn because of inadequate visual perception can be trained into normal perception before entering the first grade, there should be a saving of time, energy, and cost, and prevention of misery for both the child and the teacher.

General Purpose

The general purpose of the study was to determine if a program could be developed where perceptually handicapped kindergarteners could be identified by means of a standardized group test and helped in a regular classroom by regular teachers.

Specific Purposes

The study was specifically designed to measure the effects of three types of training programs on the reading readiness of perceptually handicapped children. A child who scored at or below the 25th percentile on the Marianne Frostig Developmental Test of Visual Perception, 3rd edition (Frostig, Lefever and Whittlesey, 1961), was designated as "perceptually handicapped". The independent variables (the three programs) were:

(1) Training in large muscle coordination and eye movements (Kephart Program)

(2) Development of perceptual skills (Frostig Program)

(3) A combination of (1) and (2) (Kephart-Frostig Program)

Additional Objectives

Relationship to Classroom Adjustment -- Although no attempt was made to measure changes in behavior, a study was carried out to see if there was a difference between behavioral characteristics of visually perceptually handicapped and non-handicapped kindergarteners.

Relationship to Vision -- A small study was also designed to see if there was a difference in the actual vision of kindergarteners with perceptual difficulties as opposed to those with excellent perception.

Hypotheses

The study was specifically designed to test three hypotheses as follows:

1. Visually perceptually handicapped children who follow the Kephart recommendations for perceptual training will be better prepared for reading as indicated by having significantly higher scores on a standarized reading readiness test than those not receiving the training.
2. Visually perceptually handicapped children who follow the Frostig recommendations for perceptual training

will be better prepared for reading as indicated by having significantly higher scores on a standarized reading readiness test than those not receiving the training.

3. Perceptually handicapped children receiving a combination of the Kephart and Frostig training programs will show gains greater than by either one alone.

The additional objectives concerning classroom adjustment and vision led to the testing of two more hypotheses:

4. There is a relationship between classroom adjustment of kindergarteners as measured by teachers' ratings of behavioral characteristics, and the perceptual quotient scores on the Frostig Developmental Test of Visual Perception.
5. There is no difference between the vision of children who score low and those who score high on the Frostig Developmental Test of Visual Perception.

General Design

The Major Study

A 2x2 factorial design was set up as follows:

FIGURE 1

DESIGN OF THE MAJOR STUDY

	Kephart Training	No Kephart Training
Frostig Training	6 classes	6 classes
No Frostig Training	6 classes	6 classes

This design allowed a study of the interaction effect of both types of training as well as the effect of separate programs. Handicapped children within classes varied in number from one to nine. Random assignment of classes rather than of individual children eliminated the necessity of either pulling children out of classes or of providing all different treatments within one classroom. The scores representing each classroom were computed by determining the mathematical mean of the scores for each class.

At the end of the treatment period, one score had been lost due to experimental mortality. Table 1 shows the final number of groups in each cell (N), and the number of children in each treatment group (n).

TABLE 1

NUMBER OF GROUPS (N), AND NUMBER OF CHILDREN (n) IN EACH TREATMENT GROUP

	KEPHART	FROSTIG	COMBINATION	CONTROL	TOTAL
N	6	5	6	6	23
n	25	23	21	26	95

The Marianne Frostig Developmental Test of Visual Perception, 3rd edition (Frostig, Lefever and Whittlesey, 1961) was the screening instrument. Those children who scored in the lower quartile of the standardization sample, a perceptual quotient of 90 or below, were included in the groups. The perceptual quotient, rather than raw score, was used to control the effect of age difference. There has been research testing the predictive value of this measure. One study reported that visual perception as measured by the Frostig test was a better predictor of reading success in the first grade than was intelligence (Bryan, 1964).

The Lee-Clark Reading Readiness Test (Lee, Clark, 1962) was administered to measure the effects of the various types of training. The data gathered from this test was raw total scores and part scores. The Lee-Clark Test was chosen as the criterion measure because of several factors. The Livermore School District, where the experiment was performed, had had favorable experience using it. Other readiness tests have not had a high enough ceiling. It was liked by the children and is short enough to maintain their interest. Buros' reviewer considers it "a superior screening test with surprising reliability and validity for its purpose considering its brevity" (Hobson, 1959).

The Lee-Clark Manual (1962) reports reliabilities for the total test ranging from .87 to .96. This was based on split-halves corrected for length using Spearman-Brown formula and computed on raw score data only. Sub-test reliabilities are listed as:

Part I -- Letter Symbols (Tests 1 and 2) --
coefficient of .88

Part II -- Concepts (Test 3) -- coefficient of .52

Part III -- Word Symbols (Test 4) -- coefficient of .86

It should be noted that the reliability of the concepts section is relatively low. Thus, chance factors might have more of an influence on results of that part.

The identification testing was administered and scored during January, 1965. Tests were administered by credentialed school psychologists assisted by proctors. They were given to small groups (maximum of 15 children) with a ten-minute break between parts III and IV of the test.

During this time, the teachers involved in the program were given information, training and materials. Lesson plans were provided for teachers of the three experimental groups (see Appendix B). The instructions were that each group would receive 15 minutes a day of the directed activities. The training began on February 8, 1965 and continued until May 14, 1965, a total of 64 days, excluding vacations and holidays. Questions were answered and teachers were informed of the progress of the study through group meetings (two luncheons), newsletters (see Appendix A) and occasional visits or telephone conversations as requested.

The criteria testing was done during the last two weeks of May and the first week of June, 1965. All the children who had originally been identified as perceptually handicapped and who still were present in the district were tested, in small groups of 15 or less.

Relation to Classroom Adjustment and to Vision

There is no recognized standardized measure of classroom adjustment. In one study where an attempt was made to measure the relationship of such adjustment to disturbances in visual perception, "Very Low" was a rating defined as "the children detrimental to the smooth functioning of the group" (Frostig, 1963, p. 670).

In trying to arrive at a more objective measure of specific behaviors, a form was devised listing 19 items (see Appendix C). Nine of the listings were specific characteristics usually found in descriptions of well-adjusted children. The other ten were those often mentioned in describing poorly adjusted kindergarteners. Plus and minus items were interspersed on the form.

Teachers were asked to write next to each child's name all of the numbers from the list of characteristics that applied to that child. They submitted the rating forms before scores on the Frostig test were released to them. Frostig scores and teacher ratings were available for 777 children.

The Contra Costa County Vision Screening Plan (see Appendix F) was used to test the actual vision of both perceptually handicapped and non-handicapped youngsters. The screening was done by a licensed optometrist, assisted by school nurses and other clerical personnel. It was completed during the second month of the study.

Recommendations for eye testing, based on the screening, were categorized in five areas -- Visual Acuity, Refractive Errors, Coordination, Organic, and Color. Refractive Errors included Astigmatism, Myopia or nearsightedness, Hyperopia or farsightedness, combined Astigmatism and Myopia. Coordination problems included Exotropia, Esotropia, Hyperphoria and Esoploria.

A comparison was made for each aspect of the vision screening of 33 students who had tested at the low end of the curve of Frostig scores and 33 from the high end. Students were matched on age and sex. The optometrist did not know which children were in which group.

Dependent Variables

The dependent variables of the experimental study were the scores of the Lee-Clark Reading Readiness Test. There are four parts to this test.

> Test 1 -- Matching -- and Test 2 -- Cross Out -- measure visual discrimination and recognition of differences and similarities in Letter Symbols
>
> Test 3 -- Total Vocabulary and Following Instructions -- measures concepts
>
> Test 4 -- Identification of Letters and Words -- measures the young child's ability to recognize and differentiate Word Symbols
>
> (Lee, Clark, 1964)

Population and Sample

The population from which the sample was drawn was the Livermore School District, Livermore, California. All the kindergarteners, 26 classes (802 children) were included in the initial testing. Twenty-four of the classes were randomly assigned to the three treatment groups and the control group. Of the 117 children designated as perceptually handicapped, 95 remained to be post-tested.

Kindergarteners were used because (1) they are still in the age range where perceptual development is supposed to occur, (2) if training succeeded in improving reading readiness, they would be better prepared for a successful first grade reading experience, (3) it is the lowest age at which such a large group of children can be studied in the public schools, and (4) the program and the teachers in the kindergarten are generally flexible enough to include such training without its interfering with other necessary activities.

Statistical Procedures

Testing the Influence of the Treatment

Analysis of variance of total reading readiness scores were used to test Hypotheses 1, 2, and 3. Differences were to be considered significant if a .05 level were achieved.

Results were programmed for data processing at the Stanford University Computation Center using the ALGOL language on a B5500 computer system. Programming followed the formulae in Walker and Lev's Statistical Inference (1953, p. 351). Although the number of cases varied from group to group, the analysis was based only on the means of the various groups. Lindquist (1956, p. 177) calls this "The Group as the Unit of Analysis."

Due to experimental mortality, one score was missing. An adjustment was made according to Cochran and Cox's "Method of Handling Missing Data in the Analysis" (1950, pp. 72-74). The mean of the remaining scores in that cell was substituted for the missing score and one degree of freedom was subtracted from both the total sum of squares and the error sum of squares. This procedure is also discussed by Lindquist (1956, p. 146).

The question might arise as to the effects of possible non-normality and heterogeneity of variance, since the numbers in the treatment groups ranged from one to nine. The requirements for the variables to be used in computing the F-statistic are that they be independent, normally distributed, and random, and that they have the same variance. The Norton Study (Lindquist, 1956, p. 78) demonstrated the wide variety of possible departures from theoretical requirements, where F-tests could still be used. "Unless the departure from normality is so extreme that it can be easily detected by mere inspection of the data, the departure from normality will probably have no appreciable effect on the validity of the F-test, and the probabilities read from the F table may be used as close approximations to the true probabilities" (Lindquist, 1956, p. 86). There is no reason to doubt the normality of the sample used in this study.

Measuring the Relationship of Visual Perceptual Handicaps and Behavior

Hypotheses 4 was tested for acceptance or rejection on the basis of an analysis of enumeration data, using a chi-square statistic to test for independence in a 2x2 table (Walker and Lev, 1953, p. 101). Each behavioral characteristic was examined separately in this manner. Chi-square values for one degree of freedom for significance levels of .05, .01 and .001 were determined. The hypothesis was to be rejected for any of the 19 statements which did not reach the .05 level.

A determination was also made of the percent of children in each group for whom the statement describing the behavioral characteristic was checked by the teacher. For the perceptually handicapped, this was computed by dividing the number of students in that category with the characteristic present, by the total number with a perceptual quotient of 90 or below. The same procedure was used for those students with a P.Q. above 90.

Measuring the Relationship of Visual Perceptual Handicaps and Vision

In testing Hypothesis 5, a t-test for matched pairs (Crow, Davis, Maxfield, 1960, p. 53) was the statistic used. Some conversions were made before t-tests were applied. Visual acuity scores, recorded as a fraction, were changed to percent. Retinoscopy scores were based on the difference between those recorded at 90 and at 180, with consideration of the algebraic sign. In all cases, significance was based on reaching the .05 level.

CHAPTER IV

RESULTS AND DISCUSSION

Results of the Major Study

Data

The frequency distribution, mean and standard deviation of the Perceptual Quotient scores of the Frostig Developmental Test of Visual Perception are shown in Appendix D. The raw scores of the Lee-Clark Reading Readiness Test, the final criterion measure, are listed in Appendix E.

Results of Analysis

The Lee-Clark Reading Readiness Test consists of four sub-tests. All of these, plus the total test score, were analyzed separately.

Test 1 "Measures ability to discern similarities in letter forms" (Lee, Clark, 1962, p. 3). Table 2 lists the means for each treatment group.

TABLE 2

MEANS FOR TREATMENT GROUPS ON

TEST 1 OF THE LEE-CLARK READINESS TEST

KEPHART	FROSTIG	COMBINATION	CONTROL
9.0	9.4	8.3	8.0

A summary of the analysis of variance for the measurement of ability to discern similarities in letter forms (Test 1) is reported in Table 3.

TABLE 3

TWO-WAY ANALYSIS OF VARIANCE FOR TEST 1

Sources of Variation	Sum of Squares	Degrees of Freedom	Variance Estimates	F
Rows - Frostig	0.8	1	0.8	0.436
Columns - Kephart	0.0	1	0.0	0.013
Interaction	7.0	1	7.0	3.754
Within Group	35.3	19	1.86	
Total	43.1	22		

At 1 and 19 degrees of freedom the following F statistics are required for significance.

At 1%, F = 8.18

At 5%, F = 4.38

At 10%, F = 2.99

Since the level of significance stated in the design for rejection of the null hypothesis, was at 5 percent, no statistical difference can be assumed for rows, columns, or interaction, on Test 1.

Test 2 "Measures the child's ability to perceive differences in letter forms" (Lee, Clark, 1962, p. 3). Table 4 lists the means for each treatment group.

TABLE 4

MEANS FOR TREATMENT GROUPS ON
TEST 2 OF THE LEE-CLARK READINESS TEST

KEPHART	FROSTIG	COMBINATION	CONTROL
9.1	10.7	8.5	9.2

A summary of the analysis of variance for the measurement of ability to perceive differences in letter forms (Test 2) is reported in Table 5.

TABLE 5

TWO-WAY ANALYSIS OF VARIANCE FOR TEST 2

Source of Variation	Sum of Squares	Degrees of Freedom	Variance Estimates	F
Rows - Frostig	1.0	1	1.0	0.225
Columns - Kephart	7.9	1	7.9	1.838
Interaction	6.6	1	6.6	1.536
Within Group	81.2	19	4.27	
Total	96.6	22		

Since the F statistic does not reach the 5% level required for rejection of the null hypothesis, it may be concluded that no differences exist in rows, columns or interaction for Test 2.

Test 3 "Measures each pupil's oral vocabulary, his understanding of concepts, his ability to follow directions, and his knowledge of meanings" (Lee, Clark, 1962, p. 3). Table 6 lists the means for each treatment group.

TABLE 6

MEANS FOR TREATMENT GROUPS ON

TEST 3 OF THE LEE-CLARK READINESS TEST

KEPHART	FROSTIG	COMBINATION	CONTROL
15.8	17.0	16.5	17.1

A summary of the analysis of variance for the measurement of vocabulary, concepts, ability to follow directions and knowledge of meanings (Test 3) is reported in Table 7.

TABLE 7

TWO-WAY ANALYSIS OF VARIANCE FOR TEST 3

Sources of Variation	Sums of Squares	Degrees of Freedom	Variance Estimates	F
Rows - Frostig	1.0	1	1.0	1.739
Columns - Kephart	5.4	1	5.4	9.115*
Interaction	0.6	1	0.6	0.984
Within Group	11.4	19	.60	
Total	18.4	22		

*Significant at 0.01

On this basis of this analysis, the null hypothesis is rejected for columns but not for rows or interaction. The direction of the means would indicate that the Frostig Treatment plus no treatment was superior to the Kephart groups.

Test 4 "Measures ability to recognize both similarities and differences in letter and word formation, from the most simple type of gross difference to complex and minute variations" (Lee, Clark, 1962, p. 3). Table 8 lists the means for each treatment group.

TABLE 8

MEANS FOR TREATMENT GROUPS ON TEST 4 OF THE LEE-CLARK READINESS TEST

KEPHART	FROSTIG	COMBINATION	CONTROL
11.9	12.5	11.4	10.7

A summary for the analysis of variance for the ability to recognize similarities and differences in letter and word formation (Test 4) is reported in Table 9.

TABLE 9

TWO-WAY ANALYSIS OF VARIANCE FOR TEST 4

Sources of Variation	Sums of Squares	Degrees of Freedom	Variance Estimates	F
Rows - Frostig	2.6	1	2.6	0.548
Columns - Kephart	0.0	1	0.0	0.009
Interaction	7.4	1	7.4	1.540
Within Group	91.8	19	4.83	
Total	101.9	22		

Since the F statistic does not reach the 5 percent level established for rejection of the null hypothesis, it may be concluded that no differences exist in rows, columns or interaction for Test 4.

The total test score is the mathematical sum of the four subtests. Table 10 lists the means for each treatment group.

TABLE 10

MEANS FOR TREATMENT GROUPS ON TOTAL SCORE OF THE LEE-CLARK READINESS TEST

KEPHART	FROSTIG	COMBINATION	CONTROL
43.9	49.5	46.4	45.3

A summary of the analysis of variance for the total test scores is reported in Table 11.

TABLE 11

TWO-WAY ANALYSIS OF VARIANCE FOR TOTAL TEST SCORES

Sources of Variation	Sums of Squares	Degrees of Freedom	Variance Estimates	F
Rows - Frostig	4.4	1	4.4	0.220
Columns - Kephart	30.3	1	30.3	1.519
Interaction	65.9	1	65.9	3.305
Within Group	379.1	19	19.95	
Total	479.7	22		

At 1 and 19 degrees of freedom the following F statistics are required for significance.

At 1%, F = 8.18

At 5%, F = 4.38

At 10%, F = 2.99

Since the level of significance stated in the design for rejection of the null hypothesis, was at 5 percent, no statistical difference can be assumed for rows, columns, or interaction on the total test scores.

Based on these statistical results, none of the first three hypotheses can be accepted.

Discussion of Results of the Major Study

Although statistical significance for rejecting the null hypothesis and thus upholding the experimental hypothesis was not reached with this data, both Test 1 and the total test scores showed interaction F statistics at the 10 percent level. This would indicate that the direction of the results might be as predicted in the following way.

In Test 1, which measured ability to discern similarities in letter form, all treatment means were higher than the control group mean. However, of the three treatments, the combination group was lowest. One possible explanation for this was the fact that the combination group covered only half as much Kephart material as the Kephart group and only half as much Frostig material as the Frostig group. Possibly if the treatment period had been longer, a stronger interaction would have occurred.

In the total scores, the Frostig and the combination group had higher means than the control group, with the Kephart lower. In neither the total score nor Test 1 was the Frostig sufficiently high to show row effects.

Two questions which these results elicit, are (1) Why do Tests 1 and 4 show greater differences between scores than Tests 2 and 3? and (2) Why are the Kephart groups significantly lower than the others in Test 3?

In attempting to explain why the treatments appear to have a greater effect on parts 1 and 4, it is necessary to compare (1) what these parts measure with the nature of the treatment, and (2) the intercorrelations of the sub-tests themselves. Table 12 summarizes the four sub-tests.

TABLE 12

SUMMARY OF SUB-TESTS

OF LEE-CLARK READINESS TEST (Lee-Clark, 1962, p. 3)

Test 1	Ability to discern similarities in letter forms
Test 2	Ability to perceive differences in letter forms
Test 3	Oral vocabulary, understanding of concepts, ability to follow directions, knowledge of meanings
Test 4	Ability to recognize both similarities and differences in letter and word formation

It may be noted that "similarities in letter form" is common to both Tests 1 and 4. Both the Kephart and the Frostig training, includes practice in matching, though not with letters. One of the Kephart activities involves constructing match-stick designs similar to a prearranged pattern. Several of the Frostig dittoes are concerned with finding figures in a row that match the first drawing.

On the other hand, these activities are only a minor part of the total training and it is difficult to assume that they alone would have a major effect. Both programs also included visual training activities and some emphasis on observing details. Why this should improve ability to detect similarities but not differences is not clear.

In the Lee-Clark Manual, Parts 1 and 2 are combined into a category called "Letter Symbols." Unfortunately there is no way to ascertain separately the correlation coefficients of Part 1 or Part 2 with the other parts. Table 13 shows the correlation coefficients as given in the manual (Lee-Clark, 1962, p. 4).

TABLE 13

CORRELATION COEFFICIENTS FOR THE LEE-CLARK READING READINESS TEST, TOTAL AND PART RAW SCORES, KINDERGARTEN. N = 159

Variable	Possible Score	Concepts	Word Symbols	Total
Letter Symbols (Tests 1 and 2)	24	.24	.42	.82*
Concepts (Test 3)	20		.28	.48*
Word Symbols (Test 4)	20			.80*

*Since the part scores are included in the Total scores, these * coefficients are spuriously high.

As might be expected, there is a higher correlation between letter symbols and word symbols than between concepts and either letter or word symbols. Our sample apparently followed this same pattern.

In trying to answer our second question concerning the low

Kephart scores on Part 3, let us look at the reliability data, published in the manual. This is summarized in Table 14.

TABLE 14

RELIABILITY COEFFICIENTS FOR THE LEE-CLARK READING READINESS TEST, TOTAL AND PART RAW SCORES, KINDERGARTEN. N = 159

(Lee-Clark, 1962, p. 3)

Variable	Reliability Coefficient
Letter Symbols (Tests 1 and 2)	.88
Concepts (Test 3)	.52
Word Symbols (Test 4)	.86
Total	.88

Test 3, which measures Concepts, has a low reliability coefficient. Thus, chance may have played a greater role in producing the results for this part. However, it should also be noted that the Kephart treatment emphasizes physical coordination and eye training and presents few opportunities for developing linguistic concepts.

Let us now turn to other factors possibly influencing the overall results of this research. Most important are the results of the vision tests reported in the third part of this chapter and their ultimate interaction effect with the perceptual training, reported in the fourth part of this chapter.

In addition there were two other factors to be considered:

(1) teachers' application of experimental activities and (2) interaction of the pre-test with the Frostig experimental group.

Teachers -- Thirteen teachers were involved in the experiment. With eleven of them, both A.M. and P.M. sessions were included. The other two teachers worked with only one session involved in the specified treatment. In a field study, such as this, it is difficult to control teacher factors such as motivation and interest level, previous knowledge of procedures, and similar application of treatment. The two methods used in this study to attempt to control these variables were randomization of teacher assignments and an emphasis on good teacher-research coordinator communication.

The first of these, randomization of groups rather than individuals lessened the opportunity of one skilled or inept teacher with a large number of perceptually handicapped children in her class, influencing results aside from the effects of the treatment itself. Lindquist (1956, p. 173) says that it would seem undesirable to give extraneous factors, such as the teacher used with the method, more weight in some classes than in others, just because there happened to be more students in those classes. Where the unweighted group mean is used as the criterion measure, and the effects of the treatment tested against variations in these means, there is some efficiency lost, but it is a safer method than using individual scores.

The other way in which it was hoped to equalize the teacher variable was by emphasizing good communications between the teachers and the research coordinator. Attempts to accomplish this were by such methods as (1) holding luncheon meetings at which problems were discussed, (2) sending out newsletters periodically (see Appendix C), (3) classroom visits by the research director and (4) invitations to telephone for advice.

One of the problems aired by the teachers was the time limitations imposed. Since the number of children receiving the treatments varied, the 15 minute time requirement was considered too long for one child, alone, but too short for 9. It was agreed that the 15 minutes should apply to 4 or 5 children (the mean number) but where more were involved, the time should be extended so that each child has a chance to participate in the activity at least once. With less than four, the time was shortened at the discretion of the teacher. This adjustment could not be any more specific, since there were some activities that the children did together and others one at a time.

Another question that arose was what to do in the case of missing lessons, i.e., either the child was absent or the teacher forgot or was unable to give the assignment. It was agreed that the lesson plans would be followed as dated and no attempts would be made to "make up" lost lessons. Since most of the activities were repeated several times, this plan was possible. It was assumed that these absences would be randomly and equally distributed among all of the treatments. No check of this was made.

A third question was what to do in the case of one child who was much more or less proficient than the others in any one activity. Should he have less or more practice than the others or the same amount. The response to this was to try to bring each child up to the minimum acceptable level of performance on that activity if it were possible within the time limit prescribed, and not to require a proficient child to repeat an activity on which he did well.

A fourth question was concerned with allowing non-perceptually handicapped children who had had borderline scores, to join the others in the training. This was allowed but, of course, they were not included in the final testing.

Questions and answers were shared with the entire group of teachers and discussions were encouraged. Since several of the teachers expressed feelings of inadequacy or fear of doing something wrong they received much reinforcement of correct procedures through praise when appropriate, as well as reporting and use of their suggestions.

When the lesson plan called for materials that the teacher normally would improvise, these were provided so as to be standard throughout the study. For example, matchstick figures were needed for some of the training. A volunteer group of mothers deheaded the matches and assembled identical models for all teachers requiring them.

Although all of these methods were used to keep the treatments constant, the fact remains that the teachers differed.

Pre-test interaction -- Table 15 shows the relative positions of the means of the treatment groups on the four sub-tests and on the total score of the Lee-Clark Readiness Test.

TABLE 15

RELATIVE POSITIONS OF MEAN SCORES
ON THE LEE-CLARK READINESS TEST

TEST 1		TEST 2	
Frostig	9.4	Frostig	10.7
Kephart	9.0	Control	9.2
Combination	8.3	Kephart	9.1
Control	8.0	Combination	8.5

TEST 3		TEST 4	
Control	17.1	Frostig	12.5
Frostig	17.0	Kephart	11.9
Combination	16.5	Combination	11.4
Kephart	15.8	Control	10.7

TOTAL SCORE	
Frostig	49.5
Combination	46.4
Control	45.3
Kephart	43.9

An inspection of Table 11 shows the Frostig to occupy the top position in 4 out of 5 of the columns and be very close on the other one. There are several possible explanations for this. One would be chance. Another would be the expected relationship of correlated means since the same children are being measured on each test. A third possibility could be that the Frostig is a superior method.

However, it is important to consider the possibility of a reactive effect of the pre-test on the Frostig treatment group. Campbell and Stanley (1963) discuss this as a possible factor jeopardizing external validity. They define it as, "The reactive or interaction effect of testing in which a pre-test might increase or decrease the respondent's sensitivity or responsiveness to the experimental variable" (Campbell and Stanley (1963, pp. 175-176). This effect has been demonstrated in studies of attitude change (Campbell, 1957) and improvement of subject matter skills (Solomon, 1949; Entwisle, 1961).

A more recent study tested the effect of pretesting on a perceptual task (McBeath, in print). The criterion measure used was the coding sub-test of the Wechsler Intelligence Scale for Children (Wechsler, 1949). A first grade class was divided randomly into two groups. Group I received WISC Coding - B test. Group II received no test but were also taken from the room and given a placebo task. Then, both groups, I and II, received four days training on related dittoes. On the 5th day, both groups were given, as a post test, WISC Coding - A. Group I tested significantly higher than Group II on the post test even though the training of the two groups was identical. The pre-test and post tests were similar but not identical.

In the present study, the pre-test was a necessary device in screening which children would be included in the experiment. The post test was not intended to measure perceptual ability, but rather the effects of attempting to improve perception. It may very well be, however, that a correlation exists between a reading readiness test and a test of perception. The Frostig Program for the Development of Visual Perception (Frostig and Horne, 1964) is quite similar to the Frostig Developmental Test of Visual Perception

(Frostig, Lefever and Whittlesey, 1961). That a reactive effect may have occurred is quite plausible.

Results of the Study on Relationship to Behavior

Data

The 2x2 tables on which the statistics were computed are reproduced in Appendix H.

Results of Analysis

Table 16 lists the statements on which the ratings were based, the percent of children in each category who were rated by their teachers as displaying that characteristic, and the computed chi-square statistic. The two categories P.Q. < 91 and P.Q. ≥ 91 were devised by using the operational definition of perceptually handicapped as those children whose perceptual quotient (P.Q.) score was 90 or below on the Frostig test. Table 16, therefore, allows for a comparison of the behavioral characteristics, as seen by teachers, of perceptually handicapped and non-handicapped children.

Chi-square values for one degree of freedom for significance levels of .05, .01 and .001 are respectively 3.8, 6.6 and 10.8. Since none of the chi-square values were below 3.8, the hypothesis was accepted for each of the 19 statements at a level of significance of .05 or better and the hypothesis is upheld.

TABLE 16

PERCENT OF CHILDREN IN EACH GROUP FOR WHOM STATEMENT WAS CHECKED BY TEACHER

Statements on Which Ratings were Based	P.Q. < 91 (N = 117)	P.Q. ≥ 91 (N = 660)	Chi-Square
1. Shows signs of fatigue such as tears with little apparent reason, wiggling, lying down in midst of activity.	26%	8%	31.419***
2. Needs to be given instructions individually more than the average child you have taught.	45%	10%	96.969***
3. Generally sees a task through to completion.	44%	79%	63.196***
4. Participates willingly in nearly all activities.	56%	77%	20.995***
5. Helps others without prompting.	13%	31%	16.290***
6. Shows frequent frustration by such signs as fighting, giving up easily, attempting to destroy projects.	28%	10%	28.164***
7. Follows instructions.	42%	70%	34.034***
8. Is cheerful majority of the time.	59%	74%	11.220***
9. Is rejected or ignored by most of the other children.	20%	7%	19.055***
10. Shows signs of withdrawal such as not interacting with others, not participating, not speaking.	16%	8%	6.853**
11. Makes daily bids for attention by interrupting teacher, hanging on to her skirt, tattling, and whining.	16%	10%	4.210*

TABLE 16 (Cont'd)

Statements on Which Ratings were Based	P.Q. < 91 (N = 117)	P.Q. ≥ 91 (N = 660)	Chi-Square
12. Shows nervous mannerisms such as tics, nail-biting, frequent trips to bathroom, inability to relax.	23%	8%	23.613***
13. Works independently when directed to do so. Also works well with others.	34%	66%	43.000***
14. Is sought after by many other children as a companion.	9%	27%	16.436***
15. Shows more restless activity than the average child you have had.	30%	10%	37.411***
16. Enjoys trying new things.	24%	52%	30.330***
17. Critical of own work or that of others.	1%	7%	6.539*
18. Can verbally express needs.	35%	61%	27.131***
19. More distractible and flighty than the average child you have had.	27%	8%	37.098***

*Significant at .05
**Significant at .01
***Significant at .001

Discussion of Results of the Study on Relationship to Behavior

Although no attempt was made to label a description as positive or negative, a simple inspection would divide the statements into desirable or undesirable traits (see Table 17).

TABLE 17

RATING STATEMENTS CATEGORIZED AS POSITIVE OR NEGATIVE

STATEMENT NUMBER	POSITIVE (P) or NEGATIVE (N)	STATEMENT NUMBER	POSITIVE (P) or NEGATIVE (N)
1	N	11	N
2	N	12	N
3	P	13	P
4	P	14	P
5	P	15	N
6	N	16	P
7	P	17	N
8	P	18	P
9	N	19	N
10	N		

Although teachers checked fewer of the negative descriptions than the positive ones, for both groups of children, the differences still appeared. For example, Statement 6, "Shows frequent frustration by such signs as fighting, giving up easily, attempting to destroy projects," would generally be considered a negative attribute. Of the perceptually handicapped children, 28 percent were rated as having this characteristic, while only 10 percent of the non-handicapped group were so rated.

Similarly, on a positive description such as Statement 8, "Is cheerful majority of the time," although 59 percent of the handicapped children were rated as having the characteristic, 74 percent of the non-handicapped group were considered to be in this category.

Thus, even though teachers tended to use the negative ratings less often for both groups, the negative ones appeared to differentiate as well as the positive.

It is difficult to arrive at a satisfactory way of measuring classroom adjustment. "The human rater -- is imperfectly reliable and often not highly valid in his recorded judgments" (Remmers, 1963, p. 372). Yet the rating form is probably the most widely used measuring tool in research on education. Why is this so?

> Many of the variables in research on teaching are so complex that tests, questions, and objective behavior records are either inadequate or too inconvenient. Sometimes we need what only a recording instrument as sensitive, complex, and alert as a human observer can tell us about the behavior or characteristics of another person or object, and then we turn to the methods of recording and communicating such messages called rating scales (Remmers, 1963, p. 329).

Therefore, though there may be some invalidity and unreliability where rating scales are used, they are often desirable, as in this study, where other methods of measuring behavior are not feasible.

In order to improve the validity of the instrument, descriptions were as objective and behavioral as possible for lack of this was the fallacy of other instruments inspected. In an adjustment scale used in one study, although some of the descriptions were objective, others seemed to need a much more subjective interpretation; expressions such as "sympathy", "degree of tension" and "outgoingness" (Medinnus, 1961).

The other measure taken to prevent bias of results was inspecting each item individually rather than trying to construct a picture of a well-adjusted or poorly adjusted child, based on the total ratings.

These results in no way imply causality. That is, we have no way of knowing, at present if poor perception causes poor adjustment or *vice versa*, or, indeed, if a third factor is involved. This study has shown only that a relationship exists between the characteristics that a teacher observes in a kindergartener, and his perceptual quotient as measured by the Frostig test.

Results of the Study on Relationship to Vision

Data

Visual acuity is based on the ratio 20:20 which indicates that a viewer can see at 20 feet what the average person can see at 20 feet. Normal vision, in this aspect, is usually recorded as 20/20. The numerator refers to the distance the testee stands from the material viewed. Therefore, the numerator is always 20. The denominator refers to the distance the average person would be from the material viewed, if he saw it as it was seen by the testee at 20 feet. Thus, 20/40 means seeing at 20 feet what the average person sees at 40 feet. The ratio may be expressed as a percentage, with 20/20 being converted to 100 percent and 20/40 to 50 percent.

Retinoscopy tests are used to diagnose astigmatism. Measures are taken at 90° and 180°. Scores are based on the difference between that recorded at 90 and that at 180, taking into consideration the algebraic sign attached to the measure. For example, one student's right eye is -0.25 at 90 and +0.50 at 180. The absolute algebraic difference between -0.25 and +0.50 is 0.75. His left eye had an absolute algebraic difference of 0.25. The larger of these, the 0.75 was recorded as his retinoscopy score.

With both visual acuity and retinoscopy scores, statistics were based on data recorded for the worse eye. Other aspects of the screening were inspected, but there were too few cases in each category to apply statistics. However, the data on the rest of the visual testing of the matched pairs as recorded by the optometrist, is listed in Appendix G according to high and low P.Q.

Although only the 33 matched pairs were used for this part of the study, the screening was done on all children who had tested as being perceptually handicapped.

Results of Analyses of the Vision Tests

Table 18 shows a summary of the results of the t-tests for matched pairs, for the acuity data and the retinoscopy data.

TABLE 18

NUMBER, MEAN DIFFERENCE, STANDARD DEVIATION AND t FOR TWO VISION TESTS

Type of Test	Number	Mean Diff.	S.D.	t
VISUAL ACUITY	33 Pairs	.070	.199	2.015*
RETINOSCOPY	33 Pairs	.098	.552	-1.025

*Significant at 0.05

The t on visual acuity was computed as 2.015. For 32 degrees of freedom, t at the .05 level of significance is 1.69. Thus, the null hypothesis is rejected on this aspect of the test.

The t on retinoscopy was -1.025. Since $t_{.05} = 1.69$ at 32 degrees of freedom, which is greater than the absolute value of the computed t, the null hypothesis cannot be rejected for this comparison.

Since Hypothesis 5 states that there is no difference between the vision of children who score low and those who score high on the Frostig test, and a significant difference was found on one aspect of the test, the hypothesis may not be accepted.

Discussion of the Vision Tests

One possible criticism of the analysis of the vision data might be use of the scores of the worse eye. Some may think it would have been preferable to use the better eye.

The first consideration of this researcher in using data on the worse eye, was that an attempt was being made to measure a handicap if such existed. A child with 20/50 vision is obviously handicapped more than one with 20/20 acuity, even if he does not use his poor eye at all. At least his stereoscopic vision would be affected. If only the score of the better eye were used in the analysis, both children would be rated at 20/20.

Another possibility might have been to average the scores from both eyes. This appeared to be too much like throwing away data although it might have been a satisfactory compromise.

Results of the vision testing were surprising in light of the literature. In his chapter entitled "The Development of Perception," Kingsley made the following statements.

> The city-bred person has difficulty making the fine discrimination needed to see a wild animal, such as a deer, hidden among the brush on a hillside when his woodsman companion points at the animal. The difference is not one of visual acuity but of perceptual training (Kingsley and Garry, 1957, p. 330).

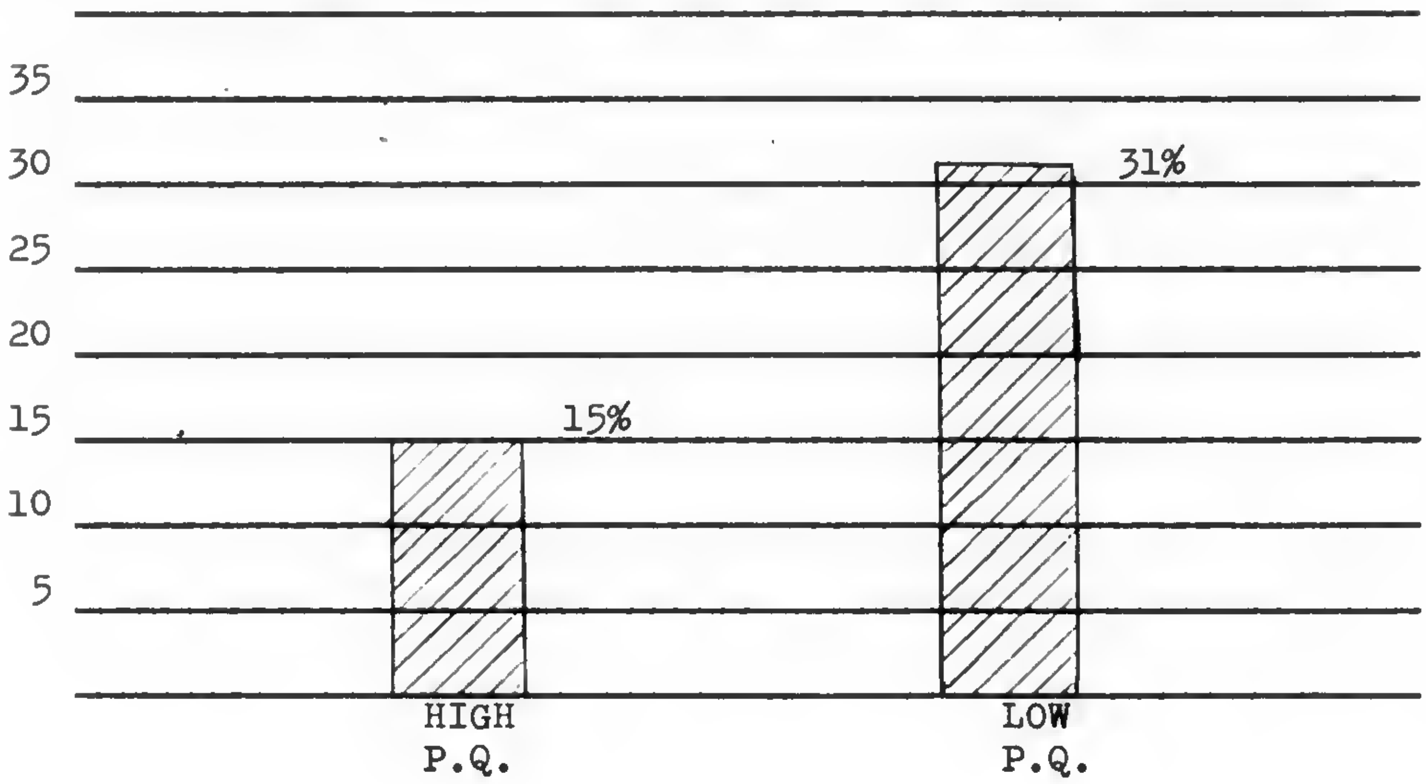
Others have been a little less definite in differentiating but still imply adequate acuity. For example, one author writes "Perhaps the ocular machinery is in order, but the child has not learned to use it efficiently" (Fitzgerald, 1963, p. 415).

Marianne Frostig includes the possibility of ocular problems. "Perceptual disturbances do not only occur when sense channels are defective -- when a visual or auditory defect occurs in the end organ, the eye or the ear" (Frostig, 1962, p. 55). However, she does not state that strictly visual problems might significantly affect results of her test.

Figure 2 illustrates graphically the differences in visual acuity of the two groups.

FIGURE 2

PERCENT OF CHILDREN WITH LOW AND HIGH PERCEPTUAL QUOTIENTS HAVING 20/30 OR POORER VISUAL ACUITY IN THE WORSE EYE



It may be seen that there were twice as many low P.Q. children with poor visual acuity as high. This opens up several questions: (1) Are problems of visual acuity normally accompanied by perceptual difficulties? (2) If those children with visual problems who test poorly on the Frostig test, have their vision corrected, will there be a noticeable change in a Frostig retest score? (3) Would training to improve perception tend to improve visual acuity?

Answering these questions is not within the scope of this paper. However, an internal analysis of the results of the main study, taking into consideration the vision findings, can illustrate how one might answer such questions. This is illustrated in the following section.

An Internal Analysis

The major study of this dissertation was done with the assumption that no difference existed between the actual vision of perceptually handicapped and non-handicapped kindergarteners. The findings of the vision study casts doubt on this assumption. Since the major study only used those children who tested as perceptually handicapped, why might the vision test results affect the study?

The answer to this question lies in the fact that we do not know, when a child tested low on the Frostig Test of Developmental Perception, whether his score was low because he was perceptually handicapped or because he had problems in visual acuity, or both. Engel and Reed (1963) found that palsied children with oculomotor handicaps such as strabismus showed severe deficiency in performing a perceptual task. This internal analysis was computed to see if there might be some interaction effects of near-sightedness on the various treatments. It must be emphasized, however, that these analyses are done only as indications of the need for future research in which the hypotheses they represent can be purposely tested.

Since the analysis assumes that there is a difference in the visual acuity of low and high P.Q. children, it was first necessary to ascertain that no difference existed between low P.Q. (any child who scored below the 25th percentile) and very low P.Q., the 33 matched pairs being the extreme of the range. Regression could have caused some of the discrepancy. All of the perceptually handicapped children's scores were to be used in the internal analysis so a t-test was used to test the significance of the means of the low 33 and the rest of the handicapped group. The results are reported in Table 19.

TABLE 19

NUMBER, MEAN, STANDARD DEVIATION, AND t

FOR POOREST EYE ON TESTS OF VISUAL ACUITY

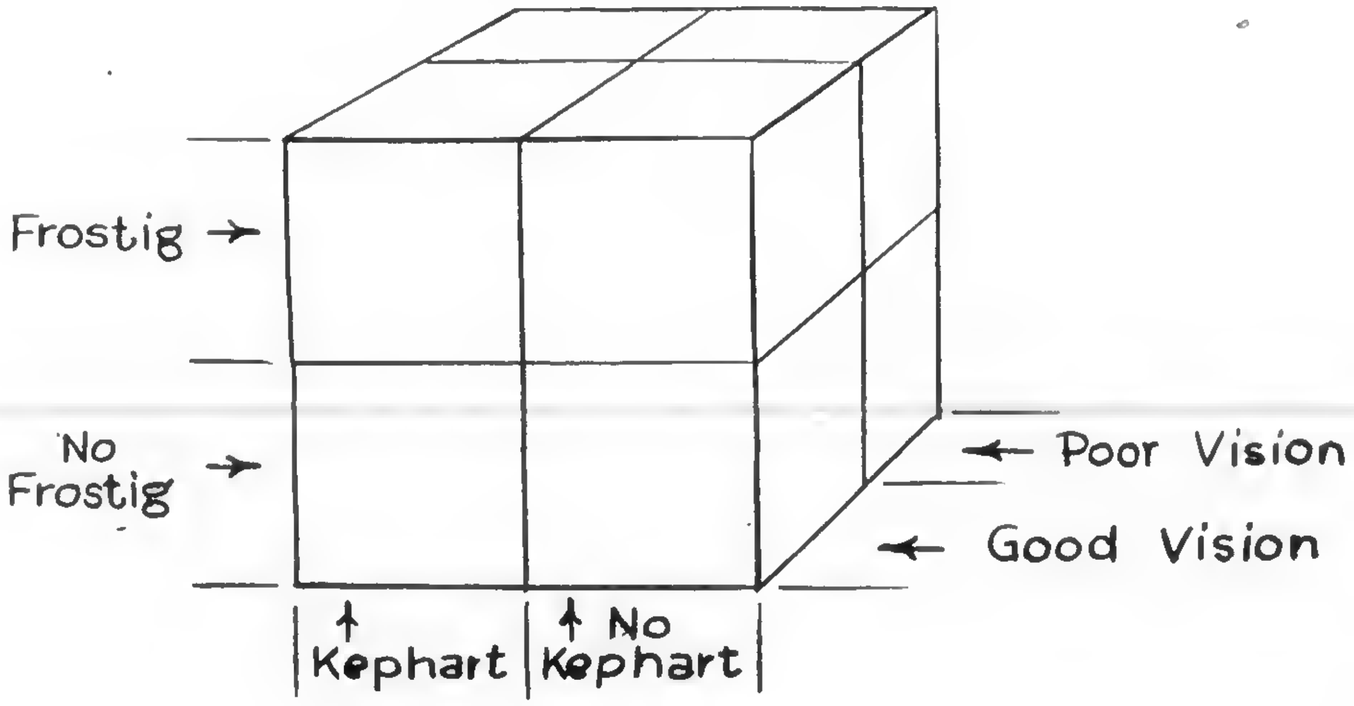
	N	Mean	S.D.	t
Lowest P.Q. Scores	33	31.52	30.99	0.042
Rest of P.H. Group	77	31.17	43.18	

As there was no significant difference between the means, it was considered acceptable to proceed with the analysis.

Figure 3 illustrates the manner in which the 2x2x2 analysis of variance was set up, to test the vision interaction.

FIGURE 3

2X2X2 ANALYSIS OF VARIANCE



Subdividing the original groups into those with good and poor vision resulted in an unequal number of cases in each cell. An exact test of significance was not necessary since these analyses are only to suggest future experimentations. Adjustments were made in the manner suggested by Cochran and Cox (1950, pp. 72-74) and Lindquist (1956, p. 148). "The simplest and most practicable procedure in general is to replace each missing datum by a value equal to the mean of the remaining observations in the same treatment subgroup (cell) and then to proceed in the usual manner, having first substracted one degree of freedom for each of the missing observations from the degrees of freedom for total, and thus also from the degrees of freedom for error" (Lindquist, 1956, p. 148). After this adjustment was made, analyses followed the computational procedures for three-dimensional designs described in Chapter 10 of *Design and Analysis of Experiments in Psychology and Education* (Lindquist, 1956, pp. 220-253). Using these procedures, the results of the Lee-Clark Reading Readiness Test was reanalyzed.

In Table 20, N stands for the number of groups in each cell, while n is the actual number of children who received both the treatment and the eye tests. In order to control the teacher variable, N was used in determining whether or not significant differences existed.

TABLE 20

NUMBER OF GROUPS (N) AND NUMBER OF CHILDREN (n) WHO HAD TREATMENTS AND VISION EXAMINATIONS

		KEPHART	FROSTIG	COMBINATION	CONTROL	TOTAL
Good	N	5	3	5	6	19
Vision	n	15	12	9	20	56
Poor	N	4	5	5	2	16
Vision	n	9	11	11	4	35
Total	N	9	8	10	8	
	n	24	23	20	24	

GRAND	N	35
TOTAL	n	91

Although the N's in Table 19 range from 2 to 6, a 2x4 chi-square test for goodness of fit shows there to be no significant difference at the 5 percent level between size of groups.

Table 21 lists the means of Test 1 for each treatment group dividing students into good and poor vision categories. Test 1 measures ability to discern similarities in letter form.

TABLE 21

MEANS FOR TREATMENT AND VISION GROUPS ON TEST 1 OF THE LEE-CLARK READINESS TEST

	KEPHART	FROSTIG	COMBINATION	CONTROL
Good Vision	10.32	9.06	8.80	7.26
Poor Vision	7.45	9.17	7.20	10.50

A summary for the 2x2x2 analysis of variance on Test 1 is reported in Table 22.

TABLE 22

THREE-WAY ANALYSIS OF VARIANCE FOR TEST 1

Sources of Variation	Sum of Squares	Degrees of Freedom	Variance Estimates	F
Rows-Frostig	1.28	1	1.28	0.283
Columns-Kephart	3.69	1	3.69	0.816
Blocks-Vision	0.94	1	0.94	0.208
Frostig-Kephart Interaction	3.71	1	3.71	0.820
Frostig-Vision Interaction	2.59	1	2.59	0.572
Kephart-Vision Interaction	45.79	1	45.79	10.111*
Frostig-Kephart-Vision Interaction	14.47	1	14.47	3.194
Within Cells	122.28	27	4.53	
Total	194.75	34		

F at .05 with 1 and 27 df = 4.21
*F at .01 with 1 and 27 df = 7.68

These results indicate the need to experiment with groups whose vision have been predetermined. It would seem that those who are "truly" perceptually handicapped, that is, those who test low on the Frostig test, but not because of poor visual acuity, might benefit from the Kephart method whereas those with poor vision would be better off with either the Frostig method or a regular classroom program.

The means for Test 2, taking vision into consideration, are listed in Table 23. Test 2 measures ability to recognize differences in letter forms.

TABLE 23

MEANS FOR TREATMENT AND VISION GROUPS ON TEST 2 OF THE LEE-CLARK READINESS TEST

	KEPHART	FROSTIG	COMBINATION	CONTROL
Good Vision	9.56	10.42	8.33	8.98
Poor Vision	9.28	10.90	7.93	9.33

TABLE 24

THREE-WAY ANALYSIS OF VARIANCE FOR TEST 2

Sources of Variation	Sum of Squares	Degrees of Freedom	Variance Estimates	F
Rows-Frostig	0.14	1	0.14	0.018
Columns-Kephart	15.45	1	15.45	1.907
Blocks-Vision	0.02	1	0.02	0.002
Frostig-Kephart Interaction	23.29	1	23.29	2.875
Frostig-Vision Interaction	0.00	1	0.00	0.000
Kephart-Vision Interaction	1.71	1	1.71	0.211
Frostig-Kephart-Vision Interaction	0.05	1	0.05	0.006
Within Cells	218.71	27	8.10	
Total	259.37	34		

F at .05 with 1 and 30 df = 4.17
F at .01 with 1 and 30 df = 7.56

The vision apparently had no effect on the scores of Test 2.

Test 3 measures vocabulary, understanding of concepts and following directions. Table 25 lists the means for this test.

TABLE 25

MEANS FOR TREATMENT AND VISION GROUPS ON TEST 3 OF THE LEE-CLARK READING READINESS TEST

	KEPHART	FROSTIG	COMBINATION	CONTROL
Good Vision	17.11	17.71	16.57	17.08
Poor Vision	16.00	16.63	15.43	18.17

Shown in Table 26 is a summary of the 2x2x2 analysis of variance on Test 3.

TABLE 26

THREE-WAY ANALYSIS OF VARIANCE FOR TEST 3

Sources of Variation	Sums of Squares	Degrees of Freedom	Variance Estimates	F
Rows-Frostig	3.05	1	3.05	2.766
Columns-Kephart	15.04	1	15.04	13.638*
Blocks-Vision	3.72	1	3.72	3.376
Frostig-Kephart Interaction	0.03	1	0.03	0.027
Frostig-Vision Interaction	3.58	1	3.58	3.242
Kephart-Vision Interaction	3.82	1	3.82	3.460
Frostig-Kephart-Vision Interaction	3.41	1	3.41	3.096
Within Cells	29.77	27	1.10	
Total	62.43	34		

F at .05 with 1 and 27 df = 4.21
F at .01 with 1 and 27 df = 7.68
*F at .001 with 1 and 27 df = 13.61

On this part of the test, the Frostig and the control groups did significantly better than the Kephart and the combination groups. For this aspect of reading readiness, good vision appears to make a difference. It should be remembered, however, that the reliability of this sub-test is relatively low, concepts apparently being a difficult aspect to measure.

Table 27 shows the means of Test 4, the part of the Lee-Clark which attempts to measure recognition of both similarities and differences in words as well as in letter formation.

TABLE 27

MEANS FOR TREATMENT AND VISION GROUPS ON TEST 4 OF THE LEE-CLARK READING READINESS TEST

	KEPHART	FROSTIG	COMBINATION	CONTROL
Good Vision	12.62	11.01	12.67	10.16
Poor Vision	11.58	13.67	9.17	11.83

Table 28 summarizes the 2x2x2 analysis of variance on Test 4.

TABLE 28

THREE-WAY ANALYSIS OF VARIANCE FOR TEST 4

Sources of Variation	Sum of Squares	Degrees of Freedom	Variance Estimates	F
Rows-Frostig	0.08	1	0.08	0.008
Columns-Kephart	0.31	1	0.31	0.030
Blocks-Vision	0.03	1	0.03	0.003
Frostig-Kephart Interaction	19.04	1	19.04	1.854
Frostig-Vision Interaction	1.63	1	1.63	0.158
Kephart-Vision Interaction	59.11	1	59.11	5.754*
Frostig-Kephart-Vision Interaction	8.90	1	8.90	0.866
Within Cells	277.38	27	10.27	
Total	366.48	34		

*F at .05 with 1 and 27 df = 4.21
F at .01 with 1 and 27 df = 7.68

From this table it may be seen that in teaching recognition of similarities and differences of words and letters, vision again may have an effect on those receiving the Kephart treatment.

Means for the total test results are listed in Table 29.

TABLE 29

MEANS FOR TREATMENT AND VISION GROUPS

ON TOTAL SCORE OF THE LEE-CLARK READING READINESS TEST

	KEPHART	FROSTIG	COMBINATION	CONTROL
Good Vision	49.25	48.19	46.37	43.82
Poor Vision	44.30	50.37	39.73	49.83

A summary of the 2x2x2 analysis of variance for the total test scores in shown in Table 30.

TABLE 30

THREE-WAY ANALYSIS OF VARIANCE FOR TOTAL TEST SCORES

Sources of Variation	Sums of Squares	Degrees of Freedom	Variance Estimates	F
Rows-Frostig	4.87	1	4.87	0.096
Columns-Kephart	118.28	1	118.28	2.332
Blocks-Vision	8.63	1	8.63	0.170
Frostig-Kephart Interaction	114.44	1	114.44	2.257
Frostig-Vision Interaction	22.85	1	22.85	0.451
Kephart-Vision Interaction	293.29	1	293.29	5.783*
Frostig-Kephart-Vision Interaction	3.48	1	3.48	0.069
Within Cells	1369.27	27	50.71	
Total	1935.11	34		

*F at .05 with 1 and 27 df = 4.21
F at .01 with 1 and 27 df = 7.68

On these total test results, again, the Kephart-vision interaction appears.

Glancing at all of the part scores plus the total scores one is impressed by the possible effect of poor vision on the Kephart Treatment. Only perceptually handicapped children with good vision seem to have been helped, but they may have been greatly helped. The Frostig program also appears to have helped those with good vision while those with poor vision performed at least as well as the control group. Therefore it seems to be a safe adjunct to a kindergarten program for all children who score low on the Frostig Developmental Test.

These results are based on after-the-fact analyses and are presented as a hint as to what future research might disclose.

CHAPTER V

SUMMARY AND IMPLICATIONS

The Problem and Design

The major study was designed to test the effectiveness of three reading preparedness programs for perceptually handicapped kindergarteners. The second part was a study of the relationship of classroom adjustment and perceptual ability. The third was a comparison of the vision of children with poor and with good perceptual ability.

Perceptual ability was measured by the Marianne Frostig Developmental Test of Visual Perception which was given during January, 1965, to all of the kindergarteners in the Livermore School District, Livermore, California. Any child who tested below the 25th percentile of the standardization norms, was considered perceptually handicapped. Of the 802 children tested, 117 were placed in this category. For the final criterion measures 95 children (81 percent of those beginning the treatment) were available for testing.

There were 26 kindergarten classes. For the main part of the study, 24 of these were randomly assigned to one of four groups. The perceptually handicapped children in these four groups were treated as follows.

Group 1 had 15 minutes a day of training as prescribed by Kephart. This emphasized physical coordination activities such as use of the balance beam and balance board.

Group 2 received 15 minutes a day of the Frostig Program for the Development of Visual Perception. It consisted mainly of kinaesthetic and tactile training together with work sheet exercises.

Group 3 alternated the Kephart and Frostig methods, also for 15 minutes a day.

Group 4 received no special treatment other than the normal classroom activities.

Teachers were given lesson plans for each day so that application of the independent variable would be relatively consistent. The training continued over 64 school days, from February 8, 1965 until May 14, 1965. During the last two weeks of May and the first week of June, 1965, the Lee-Clark Reading Readiness Test was administered to the children involved in the study. The four subtests and the total scores were analyzed to test the hypotheses of the major study.

For the second part of the study, that of relationship to classroom adjustment, rating forms consisting of 19 descriptions of behavior were completed and returned by the teacher in January, 1965, before the results of the tests on perception were told to them. The number of children on whom both rating forms and Frostig scores were recorded, was 777.

Vision testing was done during April, 1965, by an optometrist assisted by the school nurses. The eye examinations followed the recommendations set up in Contra Costa Vision Screening plan. Of the 117 children identified as perceptually handicapped, 110 were present for the screening. In addition, 33 children who had tested very high on the Frostig were matched by age and sex to 33 who had tested very low. These children were also given the vision examinations. None of the personnel involved in the testing knew which children were designated as perceptually handicapped and which were not.

For the major part of the study, it was hypothesized that visually perceptually handicapped children who followed Kephart's recommendations, Frostig's recommendations or a combination of the two, would be better prepared for reading than those not receiving such training, with the combination group showing the greatest gains. Preparation for reading was to be measured by a standardized reading readiness test.

It was also hypothesized that a relationship exists between a child's perceptual ability and the characteristics that teachers observe in a kindergartener.

The last hypothesis related to actual eyesight, the thesis being that no difference exists between the vision of perceptually handicapped and perceptually non-handicapped youngsters.

Results

The conclusions to be drawn from the results of the major part of the study are that trends exist in some of the directions predicted but that none of the methods tried produced statistically significant differences.

There was no significant differences between the reading readiness scores of those children who followed the Kephart recommendations and those who did not.

There was no significant difference between the reading readiness scores of those children who followed the Frostig recommendations and those who did not.

There was no significant interaction between the Kephart and Frostig methods to produce scores higher on a reading readiness test for those having had the combined treatment than for those having had either Frostig training or Kephart training alone.

As for the second part of the study, a significant relationship was found between classroom adjustment of kindergarteners and their perceptual ability. Those who scored high on the test of visual perception tended to be rated high on adjustment characteristics. Those who scored low were more apt to be rated low.

On the third part of the study, there was a significant difference between visual acuity of those children who scored low on a test of perception and those who scored high. Although no cause and effect conclusions can be drawn from this finding, it suggests that there may be two types of children who score low on a test of visual perception: those who are visually handicapped and those who are perceptually handicapped. If this were true, one would expect training in perception to be effective mainly with the perceptually handicapped.

An internal analysis was done to test this idea. The results, of course, are not precise, and need to be tested under controlled conditions, but do suggest the following:

On the total test score results as well as those parts concerned with the recognition of similarities in letters and words, an interaction of the Kephart treatment and the vision of the child was apparent. Those children with poor vision do not react to the perceptual training as do those with good vision.

An inspection of the means of the internal analysis showed that Frostig scores were consistently high. Also on all sub-tests, as well as the total score, those children with good eyesight performed better than those with poor eyesight in the Kephart and the combination groups, while the opposite was true in the control group. This would suggest the need to test the hypothesis that children who have difficulties with a test of perception because of near-sightedness do better work in a regular classroom, while those who are perceptually handicapped for other reasons, respond better to a program that includes training in perception.

Limitations

There are several limitations that may have affected the results of this study. Some were unexpected events; others were anticipated but no acceptable controls were conceived at the time. Now, in retrospect, some suggestions are presented.

Nature of the Sample

Generalization is necessarily limited to children in districts similar to the one in which the study was performed. Following are some ways in which the district differs from the average.

1. The mean I.Q. is higher than test standarization means of 100. Although the kindergarteners were not given intelligence tests, testing was done in the 4th, 5th and 8th grades. The mean I.Q. for these three grades on the California Test of Mental Maturity (Sullivan, Clark and Tiegs, 1957) for the 1964-65 school year was 108.

2. The mean scores for the Frostig Developmental Test of Visual Perception was higher than that of the standardization group.

So was the 25th percentile, which was the original cut-off point for the designation "perceptually handicapped." Standard Deviation was also greater. Table 31 compares the two groups.

TABLE 31

COMPARISON OF MEANS, 25th PERCENTILES AND STANDARD DEVIATIONS OF EXPERIMENTAL POPULATION AND STANDARIZATION SAMPLE

	MEAN	25th %ile	S.D.
Experimental Population	108.44	96.31	17.47
Standardization Sample	100.00	90.00	15.00

In selecting the sample to be used for this study, those children who scored below the 15th percentile for the district, i.e., those whose P.Q. was 90 or below, were considered perceptually handicapped.

3. A kindergarten reading program is offered for those children who qualify. A strong reading readiness program is given to the others.

Initial Testing

A great emphasis was placed by the research director on standardized procedures for administering the tests. There were, however, some conditions that may have influenced the results.

1. Although all of the test administrators were credentialed school psychologists, there were differences in their familiarity with the initial testing instrument, and with the level of children with whom most of their work had been done.

2. Unanticipated events occurred with the children in some of the classrooms (such as nosebleeds, bathroom requirements, broken pencils) while other testing ran smoothly.

3. The testing was done in two parts, with the administration of the second half varying from the same day to a week later. Sometimes the second half was given by the same tester; other times by a different person.

4. Eight hundred tests, each having 5 sections and 72 items meant 4000 sub-tests or 288,000 items to be hand-scored. This was done by a volunteer group of parents who were instructed by the director of the research and supervised by a district - office teacher - coordinator. All of the scoring was double checked by this committee. Total scores were computed by a specially trained secretary who also spot checked the scoring. Finally, the complete scoring was spot checked by the director of research. As with any hand scoring, allowance must be made for the human error. There were not a great deal of mistakes made in scoring, but there were a few.

Although all of the above factors might limit the implications of this study, it could be expected that randomization would offer some control over their effects.

Application of Treatments (The Independent Variable)

Some of the limitations to be described were discussed more thoroughly in Chapter IV where results of the major study were reported.

1. Teachers varied greatly in their knowledge of, and interest in the techniques they were to use. More time should have

been allowed preceding the study, for teachers to familiarize themselves with materials and methods.

2. The Kephart method was incomplete in one way. The use of the trampoline was omitted because of difficulty of supervision. Kephart considers work on the trampoline as an essential part of his program.

3. The Frostig program was applied to all children in the Frostig group regardless of strengths and weaknesses revealed by the original testing. Marianne Frostig recommends that each child be individually diagnosed and emphasis in training be placed on areas of weakness.

4. The possibility of pre-test-treatment interaction of the Frostig test with the Frostig training must not be overlooked.

5. The daily time allotted for treatment (15 minutes a day) appeared to be too little for some groups and too much for others, depending on the size of the groups. Ajustments were allowed, in both directions maintaining 4 or 5 as the average number for which the 15 minute lesson plans were written. There may be some question as to this method of allowing for differences.

6. It may be that three months was too short a period for the training, especially where the two methods were alternated.

7. The number of children in each class receiving the treatments varied from one to nine. It would have been better to have kept the number constant, but this would only have been possible by changing childrens' rooms, an administratively unfeasible suggestion; or by having a special teacher do the training, an economically unrealistic solution.

Criterion Measure

Two criticisms might be made of the criterion measure used for the major study.

1. Although it was made up of four parts, only one test was used as a criterion for post-treatment effect. A measure of perception might have been used to see whether training improved this ability.

2. The final testing was done late in the school year. This was unfortunate on two counts. Some of the children were more restless than usual and not enough time was allowed for make-up testing.

The rating scale used for the part of the study concerned with classroom adjustment, might be questioned because it was not a standardized measure.

The vision screening might be criticized by those who consider an office visit and use of drops in the eyes, a necessary adjunct to vision testing. However, the optometrist did bring some of his equipment to the schools and the children were prepared in advance with mock examinations. One possible source of inconsistency is that some of the children were transported by bus to the schools where the testing was done. The children who attended those schools did not have the excitement of a bus ride preceding the screening.

Handling of Data

There may be some question of the statistical analyses applied to the major study.

1. It is possible that important information was lost in combining class scores and using only means. However, it was necessary to do this because it was possible to randomly assign

classes to treatments but not subjects to classes.

2. There is no completely satisfactory way of handling missing data which cause the cells in an analysis of variance to have unequal groups. The method used in this study was to estimate missing scores, using the mean of the other scores, and then subtracting one degree of freedom for each addition. "Substitution of estimates for the missing data does not in any way recover the information that is lost through loss of data, as some experimenters have suggested, usually facetiously; it merely attempts to reproduce the results obtained by an application of the least squares method to the data that are present" (Cochran and Cox, 1950, p. 74). The reader must realize that this method does not allow for an exact test of significance. When several estimates are added, as with the 2x2x2 analysis in the present study, the test is even less exact.

The Internal Analysis

Some researchers object to any statistical analysis that was not suggested before the data were seen. Others encourage inspection of data as long as it is presented as unverified theorizing. "The good research worker habitually speculates about matters which go beyond his data, but he is at great pains to make clear when he is speculating and when he is reporting" (Walker and Lev, 1953, p. 354).

Implications

Since only trends were found as a result of the major study, the implications of it will be directed toward recommendations for future research. The relationships found in the two other sections also suggest several ideas for further study, using experimental designs.

In the vision study the fact that a significant difference existed between the visual acuity of children who tested at the extremes on a perceptual test implies the necessity for earlier and more complete eye examinations.

Further Research

All phases of this study left more questions open than were answered. Many of them suggest hypotheses that can be tested.

The Major Study - Research

1. Improvement of the present design can take into consideration the limitations discussed previously. Special teachers could be provided similar to speech or remedial reading specialists. They would work with the children away from the room. This would control the teacher factor, the number of children in each group, the time per child allotted for treatment, application of techniques and would allow for individual diagnosis.

2. Extension over a complete school year would provide greater opportunity to study the interaction effect of combining techniques.

3. As suggested by the internal analysis, eye tests could be given to all low P.Q. children. Using this, as well as Frostig scores, random assignments to groups can be made.

4. Similar training could be presented to non-perceptually handicapped children to test its effects on reading.

5. Replications could be done at other levels, both higher and lower. With the "Head Start" programs now in effect, nursery

schools might be especially amenable to such research.

6. Matching by ability might produce unexpected differences in response to the various treatments.

The Adjustment Study - Research

Since this was a study of relationships, causality is unknown. This opens up innumerable possibilities for study.

1. Does training in perception change classroom adjustment? Some of each category (well adjusted and poorly adjusted) could be randomly assigned to treatment groups for perceptual training. Post-test ratings could check the effects.

2. Does therapy aimed toward adjustment, as defined by the rating scales, improve perception? A study similar to that above, could be designed.

3. Further research might be done to see if other relationships exist. For instance, Hammond and Skipper (1962) found a significant difference between high adjustment and socio-economic status of first graders. Sex differences might become apparent. Observational studies of kindergarteners have shown that girls are characteristically less overtly aggressive than boys (Sears, Maccoby, Levin, 1957, p. 253).

The Vision Study - Research

Optometrists have been interested in perceptual problems because children often are brought in for glasses when they do not really need them. The Winter Haven Project in Florida, a program devoted to working with perceptually handicapped children, was begun because of this observation by optometrists (Rice, 1962, p. 9).

The vision findings of this study suggest the following research areas.

1. Does training in perception improve the vision of children with visual acuity difficulties? A simple design could test a hypothesis based on this question. Children with visual problems could be randomly assigned to experimental and control groups. At the end of the experiment, eye examinations could be administered and differences tested for significance.

2. The opposite question -- is improvement in vision accompanied by better perception -- would be a little more difficult to answer definitely, but still possible to study. Eye tests and perceptual tests could be given at the beginning of the year and again at the end. Those whose vision improved could be matched with those whose vision remained the same. A comparison of perceptual scores would suggest if a relationship existed.

3. It was not possible to study other aspects of vision with only 33 children in each group. Larger samples would allow for testing of differences in other areas.

4. Are there children who are both visually and perceptually handicapped? To answer this would require development of an instrument more sensitive than the Frostig test -- one which measures only perceptual problems. This might prove to be an impossible task.

5. There is a possibility that the problem is not perceptual. More complete eye testing than the Contra Costa County Screening could be done on those children who score low on a test of perception with no apparent visual cause. If vision proves to be adequate, other explanations for the poor performance must be hypothesized and tested.

APPENDIX A-1

First Newsletter Sent to Teachers

LIVERMORE SCHOOL DISTRICT

To: All Kindergarten Teachers

From: Marcia McBeath

Re: Study on Perception

Date: January 26, 1965

I want to keep you up-to-date on what is happening and will send you a little "Newsletter" like this from time to time during the next few months.

Most of the Frostig testing has been completed in spite of a few minor catastrophies such as misplaced instructions, children having nosebleeds, and an unplanned three-way phone connection while trying to trace down missing colored pencils. Chicken pox lessened the number in several rooms but we hope to do make-up testing shortly for those we missed.

The psychologists who helped me with the testing were all very much impressed with the Livermore School District and made several comments about how nice the teachers were. (Of course, I knew that all along!)

If all goes well, we can start next Monday. You'll have the lesson plans on Thursday and will know which children should be given the training by Monday morning at the latest. Of course, you can add any other children to the group that you wish.

I'll be here all day Tuesday, January 26, and Thursday morning, January 28, until noon, in case you have any questions.

MM:ljl

APPENDIX A-2

Second Newsletter Sent to Teachers

LIVERMORE SCHOOL DISTRICT

To: All Kindergarten Teachers

From: Marcia McBeath

Re: Study on Perception

Date: March 17, 1965

Here is another newsletter to keep you informed of the progress of our study.

You remember the rating forms all of you filled out on behavior traits of your students? The results of that have been compiled and are very interesting.

In comparing students with scores above 90 P.Q. and below 90 P.Q. on the Frostig Test, it was found that a significantly larger ratio of the perceptually handicapped children had been checked on the statements indicating poorer adjustment. Conversely, a larger ratio of high scorers on the Frostig were rated on statements describing good adjustment.

In other words, there was a high relationship between what you observed in the child, and his perceptual quotient.

Another exciting thing that is happening is the eye testing volunteered by Dr. Gurney, Dr. Volponi, and the U. C. School of Optometry, coordinated by Gerry Deck. In addition to the 117 children in our experimental group, they will be testing some other children who are not perceptually handicapped. I will compare the results and let you know if there is any difference in the actual vision of these two groups.

From all reports, your part of the project is progressing beautifully. You would be amazed at the unexpected influence this project is having. For instance, if you have the chance, you might stop at Instructional Materials Center and see Janet Moore's match stick abstract. After watching a group of volunteer mothers snapping tops off matches for the Kephart group, Janet became inspired.

If you have any questions or problems, don't hesitate to ask us. We may not have all the answers, but we are getting pretty good at improvising.

MM:ljl

APPENDIX A-3

Third Newsletter Sent to Teachers

LIVERMORE SCHOOL DISTRICT

To: All Kindergarten Teachers

From: Marcia McBeath

Re: Study on Perception

Date: May 10, 1965

The treatment part of our project is just about completed. This Friday, May 14, is the last day for the perceptual training activities. All children who were originally identified as being below the 25th percentile on the Frostig will be tested during the last two weeks of May. We will take them out of the room and try not to cause too much disturbance.

All seems to be going well with the study. A few children moved within the district, but wherever possible, the child was placed in a class that has a similar treatment group.

The eye tests have been completed, thanks to several people. Jerry Deck coordinated the whole thing. Lee Walter and Marfreda Coffin ran the two clinics. Several mother volunteers assisted. Dr. Hirsch from Danville did the actual testing. Funds for this were provided by Dr. Gurney and Dr. Volponi. Problems were located with such tongue-twister names as esotropia, exotropia, hyperphoria, myopia and hyperopia.

The data from the vision screening will be put on key-punched cards and we shall be able to determine if there is any difference between the vision of the perceptually handicapped child and the non-perceptually handicapped. We'll let you know the results of that, also.

If you have any comments or items that may be of interest to others, concerning the children involved in this study, I would appreciate a note from you.

Thank you again for such wonderful cooperation.

MM:cav

APPENDIX B-1

LESSON PLANS FOR PERCEPTUAL TRAINING

Kephart Only

February, 1965

Monday, February 8, 1965

Chalkboard (Directionality) -- see pp. 169-171
Walking board forward -- see pp. 217-218

Tuesday, February 9, 1965

Same as yesterday

Wednesday, February 10, 1965

The Clock Game -- opposed movement toward the center -- pp. 171-174 and 175-1(a)
Walking board forward -- pp. 217-218

Thursday, February 11, 1965

Same as yesterday

Friday, February 12, 1965

Holiday

Monday, February 15, 1965

The Clock Game -- opposed movement away from center -- pp. 174, 177 and 175-1(b)
Walking board forward -- pp. 217-218

Tuesday, February 16, 1965

The Clock Game -- same as yesterday
Walking board forward
Walking board backward -- pp. 218-219

Wednesday, February 17, 1965

Occular Pursuit Training -- Stage 1, pp. 214-242, pp. 146-150 (if necessary drop to Stages 2, 3, 4, or 5)
Walking board backward -- pp. 218-219

Lesson Plans for Perceptual Training
Kephart Only -- February, 1965
Page 2

Thursday, February 18, 1965

Same as yesterday

Friday, February 19, 1965

Occular Pursuit Training as yesterday
Angels-in-the-Snow -- bilateral movements -- pp. 230-231

Monday, February 22, 1965

Holiday

Tuesday, February 23, 1965

Same as Friday

Wednesday, February 24, 1965

The Clock Game -- opposed movement toward and away from center -- pp. 173-177
Angels-in-the-Snow -- bilateral -- pp. 230-231

Thursday, February 25, 1965

The Clock Game -- parallel movement -- pp. 177-178
Angels-in-the-Snow -- unilateral movements -- pp. 231-232

Friday, February 26, 1965

Same as yesterday

Rabello	P.M.
Good	A.M.
Henderson	P.M.
Olivotti	A.M.
Loyd	A.M.
Fennell	A.M.

MM:ljl

LESSON PLANS FOR PERCEPTUAL TRAINING

Kephart Only

March, 1965

Monday, March 1, 1965

Occular Pursuit Training -- Stage 1, pp. 241-242, pp. 146-150, as before
Balance Board with largest post -- simple balancing -- p. 222

Tuesday, March 2, 1965

Balance Board as on Monday
Walking Board -- forward and backward

Wednesday, March 3, 1965

Same as yesterday

Thursday, March 4, 1965

Marsden Ball -- pp. 254-255 -- touching with finger
Balance Board -- p. 222

Friday, March 5, 1965

Same as yesterday

Monday, March 8, 1965

Clock Game -- movement with crossed meridians -- pp. 178-179
Do movement toward center -- p. 175 -- the first 9
Balance Board -- p. 222 -- use next smaller post if children have learned to use the largest one

Tuesday, March 9, 1965

Clock Game -- as yesterday
Walking Board -- walking sideways -- p. 219

Wednesday, March 10, 1965

Clock Game -- as Monday but do second 9 -- bottom of p. 175
Walking Board -- walking sideways as yesterday

Lesson Plans for Perceptual Training
Kephart Only
March, 1965
Page 2

Thursday, March 11, 1965

Same as yesterday

Friday, March 12, 1965

Occular Pursuit Training -- repeat Stage 1 -- p. 242; pp. 146-150 as on Wednesday, February 17th
Walking Board -- front, back and sideways

Monday, March 15, 1965

Stick figures -- pp. 262-264, A, Task 1 (square), 1, 2, 3, and 4
Angels-in-the-Snow -- pp. 230-232 -- bilateral and unilateral movements

Tuesday, March 16, 1965

Same as yesterday

Wednesday, March 17, 1965

Stick figures -- pp. 262-265, B, Task 2 (rectangle), 1, 2, 3, and 4
Angels-in-the-Snow -- pp. 230-232 -- cross lateral movements

Thursday, March 18, 1965

Same as yesterday

Friday, March 19, 1965

Balance Board, Walking Board -- review

Monday, March 22, 1965

Stick figures -- p. 265, C, Task 3 (triangle), 1, 2
Walking Board -- p. 219, 220, turning and bouncing

Tuesday, March 23, 1965

Same as yesterday

Lesson Plans for Perceptual Training
Kephart Only
March, 1965
Page 3

Wednesday, March 24, 1965

Stick figures -- p. 265, D, Task 4 (diamond), 1, 2
Walking Board -- p. 219, 220 -- turning and bouncing, as yesterday

Thursday, March 25, 1965

Stick figures as yesterday
Balance Board -- p. 222 -- using smallest post for those able to use it. From now on, use smallest post if possible. However, if child cannot use smaller post, substitute others.

Friday, March 26, 1965

Stick figures -- p. 265, E, Task 5 (divided square)
Balance Board -- p. 222

Monday, March 29, 1965

Stick figures as yesterday
Balance Board with special task of bouncing a ball -- pp. 222-223

Tuesday, March 30, 1965

Stick figures -- p. 266, F, Task 6 (diagonals), 1
Balance Board with task as yesterday

Wednesday, March 31, 1965

Stick figures as yesterday
Balance Board with task of throwing beanbag or other object at a target -- p. 223

Rabello	P.M.	Olivotti	A.M.
Good	A.M.	Loyd	A.M.
Henderson	P.M.	Fennell	A.M.

MM:ljl

LESSON PLANS FOR PERCEPTUAL TRAINING

Kephart Only

April, 1965

Thursday, April 1, 1965

Stick figures -- p. 266, G, Task 7 (irregular rectangle), 1, 2, 3, 4, and 5
Balance Board -- same as yesterday

Friday, April 2, 1965

Stick figures -- same as yesterday
Balance Board -- with commands as on top of p. 224

Monday, April 5, 1965

Stick figures -- p. 266, H, Task 8 (trapezoid), 1, 2, and 3
Balance Board -- with commands as Friday

Tuesday, April 6, 1965

Stick figures -- same as yesterday
Stunts and games -- p. 233, 234 -- Duck Walk and Rabbit Hop

Wednesday, April 7, 1965

Marsden Ball -- pp. 254-255 -- touching with finger
Stunts as yesterday

Thursday, April 8, 1965

Marsden Ball - pp. 255-256 -- hitting with small bat or stick
Stunts -- p. 234 -- Crab Walk and Measuring Worm

Friday, April 9, 1965

Same as yesterday

SPRING VACATION: April 12-16

Monday, April 19, 1965

Clock Game -- movements with Crossed Meridians -- pp. 178-179
Do the first 9, top of p. 176, under movement away from center.
Balance Board -- with command, top, p. 224

Tuesday, April 20, 1965

Clock Game -- same as yesterday but do second 9
Balance Board with Marsden Ball -- p. 223

Wednesday, April 21, 1965

Chalkboard (orientation) -- pp. 180-182
Balance Board with Marsden Ball -- p. 223

Thursday, April 22, 1965

Chalkboard (orientation) -- as yesterday
Angels-in-the-Snow -- altering time -- p. 232. Repeat Bilateral, Unilateral and Cross-lateral movements in fast and slow rhythm.

Friday, April 23, 1965

Lazy Eight -- p. 182, 183
Angels-in-the-Snow to rhythm -- p. 232, 233

Monday, April 26, 1965

Repeat Lazy Eight -- p. 182, 183
Angels-in-the-Snow face down -- p. 233

Tuesday, April 27, 1965

The Circle -- pp. 185-190
Angels-in-the-Snow face down -- p. 233

Wednesday, April 28, 1965

Copying the Circle -- pp. 191-196
Rhythms on one side of the body only, pp. 235-237. Use sticks on just hands if no drums are available

Thursday, April 29, 1965

The Cross -- pp. 197-202
Rhythms -- same as yesterday

Lesson Plans for Perceptual Training
Kephart Only
April, 1965
Page 3

Friday, April 30, 1965

Review the Circle (see Wednesday) and the Cross (see Thursday). Bilateral rhythms, through regular rhythms -- p. 238

Rabello	P.M.
Good	A.M.
Henderson	P.M.
Olivotti	A.M.
Loyd	A.M.
Fennell	A.M.

MM:ljl

LESSON PLANS FOR PERCEPTUAL TRAINING

Kephart Only

May, 1965

Monday, May 3, 1965

The Square -- pp. 202-205
Repeat rhythms (Friday, April 30)

Tuesday, May 4, 1965

The Rectangle -- pp. 206-209
Irregular rhythms -- pp. 238-239

Wednesday, May 5, 1965

Review Square (see Monday) and Rectangle (see Tuesday)
Repeat irregular rhythms -- pp. 238-239

Thursday, May 6, 1965

Diagonal and Triangle -- pp. 209-210
Walking Board -- review forward, backward, and sidewise -- pp. 217-219

Friday, May 7, 1965

Repeat Triangle -- p. 210
Walking Board -- review turning and bouncing -- pp. 219-220

Monday, May 10, 1965

Pegboard -- Lines, Squares and Rectangle -- pp. 271-272
Walking Board -- forward, backward, sidewise, turning, and bouncing -- pp. 217-220

Tuesday, May 11, 1965

Pegboard -- diagonal, triangle and diamond -- p. 273
Walking Board -- same as yesterday

Wednesday, May 12, 1965

Pegboard -- multiple adjacent forms -- pp. 273-274
Balance Board -- review rocking back, forth, right, left, and bouncing a ball -- pp. 222-223

Lesson Plans for Perceptual Training
Kephart Only
May, 1965
Page 2

Thursday, May 13, 1965

Pegboard -- same as yesterday
Balance Board -- same as yesterday

Friday, May 14, 1965

Pegboard, Interlocking Forms -- p. 275
Balance Board -- Throw object at target, touch Marsden Ball, follow commands -- pp. 223-224

THE END !!

Rabello	P.M.
Good	A.M.
Henderson	P.M.
Olivotti	A.M.
Loyd	A.M.
Fennell	A.M.

MM:ljl

APPENDIX B-2

LESSON PLANS FOR PERCEPTUAL TRAINING

Frostig Only

February, 1965

Monday, February 8, 1965

Position in Space
Awareness of Parts of the Body -- p. 19
Directional Body Movements -- p. 20
Completion of Partially Drawn Figures -- p. 21

Tuesday, February 9, 1965

Relationship to other Objects -- p. 20
Duplicating Positions -- pp. 21-30

Wednesday, February 10, 1965

Repeat Duplicating Positions -- pp. 21-30
Differentiating Left from Right -- pp. 30-44

Thursday, February 11, 1965

Repeat Left-Right -- pp. 30-44
Use Pictures 9a-9b, p. 46 by following instructions on top of p. 45

Friday, February 12, 1965

Holiday

Monday, February 15, 1965

Assembling Features and Body Parts -- p. 45

Tuesday, February 16, 1965

Squares and Diamonds -- pp. 45 and 49
Triangles -- p. 49
Block Patterns -- p. 49

Wednesday, February 17, 1965

Position in Space Worksheets -- 1-6, pp. 100-101

Lesson Plans for Perceptual Training
Frostig Only
February, 1965
Page 2

Thursday, February 18, 1965

Position in Space Worksheets -- 7-11, pp. 101-102

Friday, February 19, 1965

Spatial Relationships
Positions -- p. 52
Patterns -- 1a, 1b, 1c, 1d -- pp. 52, 53, and 59

Monday, February 22, 1965

Holiday

Tuesday, February 23, 1965

Patterns 2a, 2b, 2c, 2d -- p. 54

Wednesday, February 24, 1965

Patterns (3 color), 3a, 3b, 3c, 3d -- pp. 55-56

Thursday, February 25, 1965

Patterns 5a, 5b, 5c, 5d, 5e, 5f, pp. 57, 59

Friday, February 26, 1965

Patterns 6a, 6b, 6c, 6d, 6e, 6f, p. 58

Atchison	P.M.
Allen	A.M.
Loyd	P.M.
Olivotti	P.M.
Fuller	P.M.
Davenport	P.M.

MM:ljl

LESSON PLANS FOR PERCEPTUAL TRAINING

Frostig Only

March, 1965

Monday, March 1, 1965

Spatial Relations Worksheets 1-4, pp. 106-107

Tuesday, March 2, 1965

Spatial Relations Worksheets 5-9, pp. 107-110

Wednesday, March 3, 1965

Perceptual Constancy
Exercises -- pp. 63-64 (omit bottom half of p. 64)

Thursday, March 4, 1965

Perceptual Constancy Worksheets 1-5, pp. 121-122

Friday, March 5, 1965

Perceptual Constancy Worksheets 6-10, p. 122

Monday, March 8, 1965

Visual Motor Coordination
Eye-Movement Exercises -- pp. 68-71. For the one on p. 70, use geometric forms as suggested at the bottom of the page.

Tuesday, March 9, 1965

Gross Motor Coordination -- exercises -- pp. 71-74, up to, but not including, balancing.

Wednesday, March 10, 1965

Continue with Gross Motor Coordination exercises -- pp. 74-75

Thursday, March 11, 1965

Repeat exercises from the last two days that seemed difficult for the children.

Lesson Plans for Perceptual Training
Frostig Only
March, 1965
Page 2

Friday, March 12, 1965

Visual-Motor Coordination Worksheets 1-5 -- pp. 134-135

Monday, March 15, 1965

Visual-Motor Coordination Worksheets 6-10 -- pp. 135-136

Tuesday, March 16, 1965

Figure Ground Perception
Exercises with Three-Dimensional Objects -- p. 82

Wednesday, March 17, 1965

Figure-Ground Perception Worksheets 1-5 -- pp. 146-148

Thursday, March 18, 1965

Figure-Ground Perception Worksheets 6-10 -- pp. 148-150

Friday, March 19, 1965

Position in Space Worksheets 12-17 -- pp. 102-103

Monday, March 22, 1965

Position in Space Worksheets 18-21

Tuesday, March 23, 1965

Position in Space Worksheets 22-25 -- p. 104

Wednesday, March 24, 1965

Spatial Relations Worksheets 10-13 -- p. 110

Thursday, March 25, 1965

Spatial Relations Worksheets 14-17 -- p. 111

Friday, March 26, 1965

Perceptual Constancy Worksheets 11-15 -- pp. 122-123

Lesson Plans for Perceptual Training
Frostig Only
March, 1965
Page 3

Monday, March 29, 1965

Perceptual Constancy Worksheets 16-20 -- pp. 123-124

Tuesday, March 30, 1965

Perceptual Constancy Worksheets 21-26 -- pp. 124-125

Wednesday, March 31, 1965

Perceptual Constancy Worksheets 27-31

Atchison	P.M.
Allen	A.M.
Loyd	P.M.
Olivotti	P.M.
Fuller	P.M.
Davenport	P.M.

MM:ljl

LESSON PLANS FOR PERCEPTUAL TRAINING

Frostig Only

April, 1965

Thursday, April 1, 1965

Perceptual Constancy Worksheets 32-37 -- pp. 127-128

Friday, April 2, 1965

Visual-Motor Coordination Worksheets 11-16

Monday, April 5, 1965

Visual-Motor Coordination Worksheets 17-23 -- p. 136

Tuesday, April 6, 1965

Visual-Motor Coordination Worksheets 24-29 -- p. 136

Wednesday, April 7, 1965

Figure-Ground Perception Worksheets 11-15 -- pp. 150-152

Thursday, April 8, 1965

Spatial Relations Worksheets 18-20 -- pp. 111-112

Friday, April 9, 1965

Spatial Relations Worksheets 21-24 -- pp. 112-113

SPRING VACATION: April 12-16

Monday, April 19, 1965

Perceptual Constancy Worksheets 38-41 -- pp. 128-129

Tuesday, April 20, 1965

Perceptual Constancy Worksheets 42-45 -- p. 129

Wednesday, April 21, 1965

Perceptual Constancy Worksheets 46-49 -- pp. 129-130

Lesson Plans for Perceptual Training
Frostig Only
April, 1965
Page 2

Thursday, April 22, 1965

Perceptual Constancy Worksheets 50-54 -- pp. 130-131

Friday, April 23, 1965

Visual-Motor Coordination Worksheets 30-34 -- pp. 136-137

Monday, April 26, 1965

Visual-Motor Coordination Worksheets 35-40 -- pp. 137-138

Tuesday, April 27, 1965

Visual-Motor Coordination Worksheets 41-45 -- pp. 138-139

Wednesday, April 28, 1965

Visual-Motor Coordination Worksheets 46-51 -- pp. 139-140

Thursday, April 29, 1965

Visual-Motor Coordination Worksheets 52-56 -- pp. 140-141

Friday, April 30, 1965

Visual-Motor Coordination Worksheets 57-61 -- pp. 141-142

Atchison	P.M.
Allen	A.M.
Loyd	P.M.
Olivotti	P.M.
Fuller	P.M.
Davenport	P.M.

MM:ljl

LESSON PLANS FOR PERCEPTUAL TRAINING

Frostig Only

May, 1965

Monday, May 3, 1965

Figure-Ground Perception Worksheets 16-20 -- pp. 152-153

Tuesday, May 4, 1965

Figure-Ground Perception Worksheets 21-24 -- p. 153

Wednesday, May 5, 1965

Figure-Ground Perception Worksheets 25-28 -- pp. 153-154

Thursday, May 6, 1965

Figure-Ground Perception Worksheets 29-31 -- pp. 154-155

Friday, May 7, 1965

Visual Motor Coordination Worksheets 62-66 -- pp. 142-143

Monday, May 10, 1965

Visual Motor Coordination Worksheets 67-71 -- p. 143

Tuesday, May 11, 1965

Visual Motor Coordination Worksheets 72-77 -- pp. 143-144

Wednesday, May 12, 1965

Visual Motor Coordination Worksheets 78-82 -- pp. 144-145

Thursday, May 13, 1965

Visual Motor Coordination Worksheets 83-86 -- pp. 145-146

Friday, May 14, 1965

Visual Motor Coordination Worksheets 87-90 -- p. 146

THE END!!

Atchison	P.M.	Olivotti	P.M.
Allen	A.M.	Fuller	P.M.
Loyd	P.M.	Davenport	P.M.

MM:ljl

APPENDIX B-3

LESSON PLANS FOR PERCEPTUAL TRAINING

Combination

February, 1965

Monday, February 8, 1965

Frostig: Position in Space
Awareness of Parts of the Body -- p. 19
Directional Body Movements -- p. 20
Completion of Partially Drawn Figures -- p. 21

Tuesday, February 9, 1965

Kephart:
Chalkboard (Directionality) -- pp. 169-171
Walking Board forward -- pp. 217-218

Wednesday, February 10, 1965

Frostig:
Relationship to other Objects -- p. 20
Duplicating Positions -- pp. 21-30

Thursday, February 11, 1965

Kephart: Same as Tuesday

Friday, February 12, 1965

Holiday

Monday, February 15, 1965

Frostig:
Repeat Duplicating Positions -- pp. 21-30
Differentiating Left from Right -- pp. 30-44

Tuesday, February 16, 1965

Kephart:
The Clock Game -- opposed movement toward the center -- pp. 171-174 and 175-1(a)

Lesson Plans for Perceptual Training
Combination
February, 1965
Page 2

Wednesday, February 17, 1965

Frostig:
- Repeat Left-Right -- pp. 30-44
- Use pictures 9a-9b, p. 46 by following instructions on top of p. 45

Thursday, February 18, 1965

Kephart: Same as Tuesday

Friday, February 19, 1965

Frostig: Assembling Features and Body Parts -- p. 45

Monday, February 22, 1965

Holiday

Tuesday, February 23, 1965

Kephart: The Clock Game -- opposed movement away from the center -- pp. 174, 177, and 175-1(b)
Walking Board forward -- pp. 217-218

Wednesday, February 24, 1965

Frostig:
- Squares and Diamonds -- pp. 45, 49
- Triangles -- p. 49
- Block Patterns -- p. 49

Thursday, February 25, 1965

Kephart:
- The Clock Game -- same as Tuesday
- Walking Board forward
- Walking Board backward -- pp. 218-219

Friday, February 26, 1965

Frostig:
- Position in Space Worksheets -- 1-6, pp. 100-101

Atchison	A.M.	Fuller	A.M.
Walker	P.M.	Blackmore	A.M.
Davenport	A.M.	Rabello	A.M.

MM:ljl

LESSON PLANS FOR PERCEPTUAL TRAINING

Combination

March, 1965

Monday, March 1, 1965

Kephart:
Occular Pursuit -- Stage 1, pp. 241-242, pp. 146-150.
(If necessary, drop back to Stage 2, 3, 4, or 5).
Walking Board backward -- pp. 218-219

Tuesday, March 2, 1965

Frostig:
Position in Space Worksheets 7-11 -- pp. 101-102

Wednesday, March 3, 1965

Kephart:
Same as last Friday, February 26th

Thursday, March 4, 1965

Frostig:
Spatial Relationships
Positions -- p. 52
Patterns -- 1a, 1b, 1c, 1d -- pp. 52, 53, 59

Friday, March 5, 1965

Kephart:

Occular Pursuit Training as last Monday
Angels-in-the-Snow -- bilateral movements -- pp. 230-231

Monday, March 8, 1965

Frostig:
Patterns 2a, 2b, 2c, 2d -- p. 54

Tuesday, March 9, 1965

Kephart:
Same as last Friday, March 5th

Wednesday, March 10, 1965

Frostig:
Patterns (3 color) 3a, 3b, 3c, 3d -- pp. 55-56

Lesson Plans for Perceptual Training
Combination
March, 1965
Page 2

Thursday, March 11, 1965

Kephart:
The Clock Game -- opposed movement toward and away from center -- pp. 173-177
Angels-in-the-Snow -- bilateral -- pp. 230-231

Friday, March 12, 1965

Frostig:
Patterns 5a, 5b, 5c, 5d, 5e, 5f -- pp. 57, 59

Monday, March 15, 1965

Kephart:
The Clock Game -- parallel movement -- pp. 177-178

Tuesday, March 16, 1965

Frostig:
Patterns 6a, 6b, 6c, 6d, 6e, 6f -- p. 58

Wednesday, March 17, 1965

Kephart:
Same as Monday, March 15th

Thursday, March 18, 1965

Frostig:
Spatial Relations Worksheets 1-4 -- pp. 106-107

Friday, March 19, 1965

Kephart:
Occular Pursuit Training -- Stage 1, pp. 241-242, pp. 146-150 as before
Balance Board with largest post -- simple balancing -- p. 222.

Monday, March 22, 1965

Frostig:
Spatial Relations Worksheets 5-9 -- pp. 107-110

Lesson Plans for Perceptual Training
Combination
March, 1965
Page 3

Tuesday, March 23, 1965

Kephart:
Balance Board as on Friday, March 19th
Walking Board forward and backward

Wednesday, March 24, 1965

Frostig:
Perceptual Constancy exercises -- pp. 63, 64 (omit bottom half of p. 64)

Thursday, March 25, 1965

Kephart:
Same as Tuesday, March 23rd

Friday, March 26, 1965

Frostig:
Perceptual Constancy worksheets 1-5 -- pp. 121-122

Monday, March 29, 1965

Kephart:
Marsden Ball -- pp. 254-255 -- touching with finger
Balance Board -- p. 222

Tuesday, March 30, 1965

Frostig:
Perceptual Constancy worksheets 6-10 -- p. 122

Wednesday, March 31, 1965

Kephart:
Same as Monday, March 29th

Atchison	A.M.
Walker	P.M.
Davenport	A.M.
Fuller	A.M.
Blackmore	A.M.
Rabello	A.M.

MM:llv

LESSON PLANS FOR PERCEPTUAL TRAINING

Combination

April, 1965

Thursday, April 1, 1965

Frostig:

Visual-Motor Coordination

Eye-movement exercises -- pp. 68-71. For the one on p. 70, use geometric forms as suggested at the bottom of the page.

Friday, April 2, 1965

Kephart:

Clock Game -- movement with crossed meridians -- pp. 178-179. Do movement toward center, p. 175, the first 9.

Balance Board -- p. 222 -- use next smaller post if children have learned to use the largest one.

Monday, April 5, 1965

Frostig:

Gross Motor Coordination exercises -- pp. 71-74 -- up to but not including balancing

Tuesday, April 6, 1965

Kephart:

Clock Game -- as yesterday

Walking Board -- walking sideways -- p. 219

Wednesday, April 7, 1965

Frostig:

Continue with Gross Motor exercises -- pp. 74-76

Thursday, April 8, 1965

Kephart:

Clock Game -- as Monday, but do second 9, bottom of p. 175

Walking Board -- walking sideways -- as on Tuesday

Friday, April 9, 1965

Frostig:

Repeat exercises from Monday and Wednesday that seemed difficult for the children

Lesson Plans for Perceptual Training
Combination
April, 1965
Page 2

SPRING VACATION: April 12-16

Monday, April 19, 1965

Kephart:
Same as Thursday, April 8

Tuesday, April 20, 1965

Frostig:
Visual-Motor Coordination Worksheets 1-5 -- pp. 134-135

Wednesday, April 21, 1965

Kephart:
Occular Pursuit Training -- repeat Stage 1, pp. 242, 146-150, as on March 1st
Walking Board -- front, back, and sidewise

Thursday, April 22, 1965

Frostig:
Visual-Motor Coordination Worksheets 6-10 -- pp. 135-136

Friday, April 23, 1965

Kephart:
Stick Figures -- pp. 262-264, A, Task 1 (square), 1, 2, 3 and 4
Angels-in-the-Snow -- pp. 230-232 -- Bilateral and Unilateral movements

Monday, April 26, 1965

Frostig:
Figure Ground Perception
Exercises with Three-Dimensional Objects -- p. 82

Tuesday, April 27, 1965

Kephart:
Same as yesterday

Wednesday, April 28, 1965

Frostig:
Figure-Ground Perception Worksheets 1-5 -- pp. 146-148

Thursday, April 29, 1965

Kephart:
Stick figures, pp. 262-265, B, Task 2 (rectangle), 1, 2, 3 and 4
Angels-in-the-Snow -- pp 230-232 -- cross lateral movements

Friday, April 30, 1965

Frostig:
Figure-Ground Perception Worksheets 6-10 -- pp. 148-150

Atchison	A.M.
Walker	P.M.
Davenport	A.M.
Fuller	A.M.
Blackmore	A.M.
Rabello	A.M.

MM:ljl

LESSON PLANS FOR PERCEPTUAL TRAINING

Combination

May, 1965

Monday, May 3, 1965

Kephart:
Same as Thursday, April 29

Tuesday, May 4, 1965

Frostig:
Position in Space Worksheets 12-17 -- pp. 102-103

Wednesday, May 5, 1965

Kephart:
Stick Figures -- p. 265, C, Task 3 (Triangle), 1, 2
Walking Board -- turning and bouncing -- pp. 219-220

Thursday, May 6, 1965

Frostig:
Position in Space Worksheets 18-21 -- p. 103

Friday, May 7, 1965

Kephart:
Same as Wednesday, May 5

Monday, May 10, 1965

Frostig:

Position in Space Worksheets 22-25 -- p. 104

Tuesday, May 11, 1965

Kephart:

Stick Figures -- p. 265, D, Task 4 (diamond), 1, 2
Walking Board -- pp. 219-220 -- turning and bouncing as Friday

Lesson Plans for Perceptual Training
Combination
May, 1965
Page 2

Wednesday, May 12, 1965

Frostig:
Spatial Relations Worksheets 10-13 -- p. 110

Thursday, May 13, 1965

Kephart:
Stick Figures as Tuesday, May 11
Balance Board -- p. 222 -- using smallest post for those able to use it

Friday, May 14, 1965

Frostig:
Spatial Relations Worksheets 14-17 -- p. 111

THE END !!

Good	P.M.
Atchison	A.M.
Walker	P.M.
Fuller	A.M.
Blackmore	A.M.
Rabello	A.M.

MM:ljl

APPENDIX C

RATING FORMS FOR THE STUDY ON CLASSROOM ADJUSTMENT

______________________ A.M.
P.M. ______________ ______________

(Teacher's Name) (Circle One) (School) (Date)

Next to each child's name, please put all the numbers that apply to him from the list below. For example, you might have Johnny Doe -- 1, 5, 8, 12, 15, 16. Additional comments welcomed. Please write them on the back of this form.

1. ______________
2. ______________
3. ______________
4. ______________
5. ______________
6. ______________
7. ______________
8. ______________
9. ______________
10. ______________
11. ______________
12. ______________
13. ______________
14. ______________
15. ______________
16. ______________
17. ______________
18. ______________
19. ______________
20. ______________
21. ______________
22. ______________
23. ______________
24. ______________
25. ______________
26. ______________
27. ______________
28. ______________
29. ______________
30. ______________
31. ______________
32. ______________
33. ______________
34. ______________
35. ______________
36. ______________
37. ______________
38. ______________
39. ______________
40. ______________

1. Show signs of fatigue such as tears with little apparent reason, wiggling, lying down in midst of an activity.

2. Needs to be given instructions individually more than the average child you have taught.

Rating Forms for the Study on Classroom Adjustment
Page 2

3. Generally sees a task through to completion.

4. Participates willingly in nearly all activities.

5. Helps others without prompting.

6. Shows frequent frustration by such signs as fighting, giving up easily, attempting to destroy projects.

7. Follows instructions.

8. Is cheerful majority of time.

9. Is rejected or ignored by most of the other children.

10. Shows signs of withdrawal such as not interacting with others, not participating, not speaking.

11. Makes daily bids for attention by interrupting teacher, hanging on to her skirt, tattling, and whinning.

12. Shows nervous mannerisms such as tics, nail-biting, frequent trips to bathroom, inability to relax.

13. Works independently when directed to do so. Also works well with others.

14. Is sought after by many other children as a companion.

15. Shows more restless activity than the average child you have had.

16. Enjoys trying new things.

17. Critical of own work or that of others.

18. Can verbally express needs.

19. More distractible and flighty than the average child you have had.

APPENDIX D

FREQUENCY DISTRIBUTION OF PERCEPTUAL QUOTIENTS ON THE FROSTIG DEVELOPMENTAL TEST OF VISUAL PERCEPTION

Total P.Q. Score	Number of Students	Cumulative Sum	Percentile
59	1	1	0.001
60	1	2	0.003
61	1	3	0.004
62	1	4	0.005
63	2	6	0.008
68	2	8	0.010
69	3	11	0.014
70	2	13	0.017
72	3	16	0.021
73	1	17	0.022
75	2	19	0.024
76	3	22	0.028
78	4	26	0.033
79	7	33	0.042
80	5	38	0.049
81	10	48	0.062
82	8	56	0.072
83	3	59	0.076
84	10	69	0.089
85	3	72	0.093

Frequency Distribution of Perceptual Quotients on the Frostig Developmental Test of Visual Perception

Page 2

Total P.Q. Score	Number of Students	Cumulative Sum	Percentile
86	14	86	0.111
87	4	90	0.116
88	13	103	0.133
89	6	109	0.140
90	8	117	0.151
91	13	130	0.167
92	8	138	0.178
93	16	154	0.198
94	8	162	0.208
95	8	170	0.219
96	18	188	0.242
97	20	208	0.268
98	14	222	0.286
99	15	237	0.305
100	19	256	0.329
101	16	272	0.350
102	20	292	0.376
103	14	306	0.394
104	26	332	0.427
105	17	349	0.449
106	12	361	0.465

Frequency Distribution of Perceptual
Quotients on the Frostig Developmental
Test of Visual Perception

Page 3

Total P.Q. Score	Students	Cumulative Sum	Percentile
107	20	381	0.490
108	26	407	0.524
109	16	423	0.544
110	15	438	0.564
111	12	450	0.579
112	13	463	0.596
113	14	477	0.614
114	15	492	0.633
115	14	506	0.651
116	21	527	0.678
117	13	540	0.695
118	19	559	0.719
119	14	573	0.737
120	12	585	0.753
121	16	601	0.773
122	11	612	0.788
123	14	626	0.806
124	9	635	0.817
125	12	647	0.833
126	8	655	0.843

Frequency Distribution of Perceptual Quotients on the Frostig Developmental Test of Visual Perception

Page 4

Total P.Q. Score	Students	Cumulative Sum	Percentile
127	8	663	0.853
128	8	671	0.864
129	11	682	0.878
130	12	694	0.893
131	3	697	0.897
132	10	707	0.910
133	6	713	0.918
134	6	719	0.925
135	5	724	0.932
136	6	730	0.940
137	2	732	0.942
138	6	738	0.950
139	5	743	0.956
140	5	748	0.963
141	1	749	0.964
142	5	754	0.970
143	4	758	0.976
144	3	761	0.979
145	3	764	0.983
146	1	765	0.985

Frequency Distribution of Perceptual
Quotients on the Frostig Developmental
Test of Visual Perception

Page 4

Total P.Q. Score	Students	Cumulative Sum	Percentile
147	1	766	0.986
148	4	770	0.991
149	2	772	0.994
150	2	774	0.996
151	1	775	0.997
154	2	777	1.000

Mean = 108.44

Standard Deviation = 17.47

Number Tested = 777

APPENDIX E

RAW SCORES ON LEE-CLARK READING READINESS SUB-TESTS AND TOTAL TEST

Kephart Groups

Test 1	Test 2	Test 3	Test 4	Total Score
10	5	16	11	42
10	12	17	8	47
5	5	17	5	32
12	9	17	15	53
7	12	18	18	55
11	10	18	8	47
10	11	16	15	52
6	2	17	9	34
9	12	15	12	48
10	11	15	13	49
9	11	16	12	48
11	10	15	17	53
5	9	17	14	45
10	12	19	16	57
9	12	18	16	55
12	11	18	11	52
3	3	14	5	25
12	12	17	19	60
7	12	15	8	42
10	11	20	10	51
10	3	17	1	31

Raw Scores on Lee-Clark Reading Readiness
Sub-Tests and Total Test

Kephart Groups

Page 2

Test 1	Test 2	Test 3	Test 4	Total Score
7	12	16	13	48
9	12	16	11	48
10	10	18	9	47
10	11	14	13	48

Frostig Groups

Test 1	Test 2	Test 3	Test 4	Total Score
8	10	19	10	47
10	12	14	15	51
12	8	15	10	45
8	10	15	10	43
12	12	19	10	53
9	12	18	13	52
9	11	18	16	54
8	10	16	15	49
12	12	18	16	58
8	11	18	18	55
10	11	16	11	48
10	11	18	1	40
10	12	17	20	59
11	10	18	0	39
9	11	17	11	48

Raw Scores on Lee-Clark Reading Readiness
Sub-Tests and Total Test

Frostig Groups

Page 3

Test 1	Test 2	Test 3	Test 4	Total Score
7	12	17	15	51
7	12	17	11	47
8	9	20	10	47
8	12	16	15	51
8	5	16	14	43
7	12	17	16	52
11	11	18	15	55

Kephart-Frostig Combination Groups

Test 1	Test 2	Test 3	Test 4	Total Score
6	4	14	3	27
7	5	15	0	27
12	11	17	16	56
12	12	17	20	61
8	12	17	10	47
8	10	14	8	40
7	10	18	9	44
12	11	18	16	57
8	6	13	11	38
10	12	17	11	50
10	12	16	10	48
11	11	17	15	54
9	12	18	11	50

Raw Scores on Lee-Clark Reading Readiness
Sub-Tests and Total Test

Kephart-Frostig Combination Groups

Page 4

Test 1	Test 2	Test 3	Test 4	Total Score
10	10	16	19	55
8	11	16	10	45
3	8	17	13	41
3	2	13	5	23
5	0	17	11	33
8	8	15	15	46
11	12	15	12	50
7	1	14	12	34

No Treatment (Control) Groups

Test 1	Test 2	Test 3	Test 4	Total Score
6	12	18	10	46
8	11	16	9	44
3	1	16	8	28
1	7	18	7	33
11	11	16	15	53
12	11	17	10	50
4	1	16	4	25
9	12	17	14	52
9	12	18	12	51
7	10	15	5	37
12	11	17	12	52
4	1	15	3	23

Raw Scores on Lee-Clark Reading Readiness
Sub-Tests and Total Test

No Treatment (Control) Groups

Page 5

Test 1	Test 2	Test 3	Test 4	Total Score
5	12	18	11	46
12	11	20	14	57
9	10	15	13	47
9	11	17	16	53
7	12	17	19	55
12	12	20	14	58
8	10	19	3	40
9	11	18	12	51
6	9	15	16	46
5	2	13	7	27
10	9	19	15	53
11	12	19	6	48
8	6	16	5	35
3	0	16	7	26

APPENDIX F

A COPY OF THE FORM USED TO RECORD THE RESULTS OF THE EYE EXAMINATIONS

CONTRA COSTA COUNTY VISION SCREENING

__________ Date

Teacher __________ Child's Name __________

School __________ Address __________

District __________ Grade __________ Birthdate __________

WEARS GLASSES ______ (USE FORM LETTER 2) Sent Date ______

Visual Acuity Right 20/ Left 20/

Cover Dist: T eso 0 eso

Cover Near: T eso 0 eso

Retinoscopy: Right __________ at 90 __________ at 180

Left __________ at 90 __________ at 180

Organic: __________

REFER _____ NON-REFER ______ EXAMINER __________

Examiner's report for referral letter: (Refer only) Date ______

(USE FORM LETTER 1) Check: Visual Acuity ______ Refractive Error ______

Coordination ______ Organic ______

COLOR

O.K. _____ Refer _____

Note: White cards for girls, yellow for boys

APPENDIX G

VISION TESTING DATA ON WHICH STATISTICS WERE NOT APPLIED (N=66)

(The first four categories contain scores that were recorded. The rest of the listings represent number of children diagnosed. See Appendix F for recording procedures.)

High P.Q. (N=33) (Score)		Low P.Q. (N=33) (Score)
	Cover Dist: eso	
6		3
		10
		5
	Cover Dist: exo	
4		3
		5
		3
	Cover Near: eso	
4		5
4		10
		7
	Cover Near: exo	
5		5
4		4
		3

High P.Q. (Number)		Low P.Q. (Number)
	Cover Dist: T Circled	
0		1
	Cover Dist: O Not Circled	
2		6
	Cover Near: T Circled	
0		1
	Cover Near: O Not Circled	
5		5

High P.Q. (Number	REFRACTIVE ERRORS	Low P.Q. (Number)
2	Astigmatism	6
0	Myopia	1
3	Hyperopia	2
0	Astigmatism and Myopia	0
0	Non-designated Refractive Error	1

High P.Q. (Number)	COORDINATION	Low P.Q. (Number
0	Esotropia	1
0	Exotropia	0
0	Hyperphoria	1
0	Esoploria	1

High P.Q. (Number)	ORGANIC	Low P.Q. (Number)
0		0

High P.Q.	COLOR	Low P.Q.
0		0

Note: This data reports only the findings on the 33 matched pairs. In the testing done on the rest of the perceptually handicapped group, all categories listed above were represented.

APPENDIX H

2X2 TABLES ON WHICH RELATIONSHIP OF PERCEPTION AND BEHAVIOR WERE COMPUTED

Rating No. 1 Chi Sq. = 31.419

87	30	117
606	54	660
693	84	777

Rating No. 2 Chi Sq. = 96.969

64	53	117
595	65	660
659	118	777

Rating No. 3 Chi Sq. = 63.196

66	51	117
140	520	660
206	571	777

Rating No. 4 Chi Sq. = 20,995

51	66	117
154	506	660
205	572	777

Rating No. 5 Chi Sq. = 16.290

102	15	117
455	205	660
557	220	777

Rating No. 6 Chi Sq. = 28.164

84	33	117
592	68	660
676	101	777

Rating No. 7 Chi Sq. = 34.034

68	49	117
200	460	660
268	509	777

Rating No. 8 Chi Sq. = 11.220

48	69	117
171	489	660
219	558	777

Rating No. 9 Chi Sq. = 19.055

94	23	117
613	47	660
707	70	777

Rating No. 10 Chi Sq. = 6.853

98	19	117
604	56	660
702	75	777

Rating No. 11 Chi Sq. = 4.210

98	19	117
595	65	660
693	84	777

Rating No. 12 Chi Sq. = 23.613

90	27	117
606	54	660
696	81	777

Rating No. 13 Chi Sq. = 43.000

77	40	117
223	437	660
300	477	777

Rating No. 14 Chi Sq. = 16.436

106	11	117
483	177	660
589	188	777

Rating No. 15 Chi Sq. = 37.411

82	35	117
597	63	660
679	98	777

Appendix H (Cont'd)

Rating No. 16 Chi Sq. = 30.330

89	28	117
320	340	660
409	368	777

Rating No. 17 Chi Sq. = 6.539

116	1	117
614	46	660
730	47	777

Rating No. 18 Chi Sq. = 27.131

76	41	117
258	402	660
334	443	777

Rating No. 19 Chi Sq. = 37.098

85	32	117
606	54	660
691	86	777

BIBLIOGRAPHY

Arthur, Grace. An attempt to sort children with specific reading disability from other non-readers. J. appl. Psychol., 1927, 11 (4), 251-263.

Axline, Virginia M. Nondirective therapy for poor readers. J. consult. Psychol., 1947, 11, 61-69.

Ayers, Jean. A study of perceptual problems. Reprint by Dr. Ayers, Assoc. Prof., Occup. Ther. Dep., Univer. So. Calif. (A-56).

Betts, E. A. A physiological approach to the analysis of reading disabilities. Educ. res. Bull., 1934, 13 (6&7), 135-140, 163-174.

Bronner, Augusta. The psychology of special abilities and disabilities. Boston: Little, Brown & Co., 1917.

Bryan, Q. R. Relative importance of intelligence and visual perception in predicting reading achievement. Calif. J. educ. Res., 1964, 15, 44-48.

Campbell, D. T. Factors relevant to the validity of experiments in social settings. Psychol. Bull., 1957, 54 (4), 297-312.

Campbell, D. T., & Stanley, J. C. Experimental and quasi-experimental designs for research on teaching. In N. L. Gage (Ed.), Handbook of research on teaching. Chicago, Ill.: Rand-McNally & Co., 1963.

Clemmens, R. L. (M.D.). Minimal brain damage in children. Children, Sept., Oct., 1961, 8 (5), 179-183.

Cochran, W. G., & Cox, Gertrude M. Experimental designs. New York: John Wiley & Sons, Inc., 1950.

Cohn, R. Delayed acquisition of reading and writing abilities in children. Arch. Neurol., Feb., 1961, 4 (2), 153-164.

Cowen, E. L. Psychotherapy and play techniques with the exceptional child and youth. From W. Cruickshank's Psychology of exceptional children and youth. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1955.

Crow, E., Davis, Frances, & Maxfield, Margaret A. Statistics manual. New York: Dover Publ., Inc., 1960.

Dearborn, W. F. Ocular and manual dominance in dyslexia. Psychol. Bull., 1931, 28, 704.

de Hirsch, Katrina. Tests designed to discover potential reading difficulties at the six-year-old level. Amer. J. Orthopsychiat., 1957, 27, 566-576.

Delacato, C. The treatment and prevention of reading problems. Springfield, Ill.: Charles C. Thomas, 1959.

Delacato, C. The diagnosis and treatment of speech and reading problems. Springfield, Ill.: Charles C. Thomas, 1963.

Entwisle, Doris R. Interactive effects of pretesting. Educ. psychol. Measmt., 1961, 21 (3), 607-620.

Engel, E., & Reed, C. F. Perceptual achievement and visual defect. N. Y. State Psychologist, June, 1963, 4.

Fernald, Grace, & Keller, Helen. The effect of kinaesthetic factors in the development of word recognition in the case of non-readers. J. educ. Res., 1921, 4 (5), 355-377.

Fernald, Grace, & Keller, Helen. On certain language disabilities, their nature and treatment. Ment. Measmt. Monogr., 1936, No. 11.

Fitzgerald, Agnes D. Perception skills and beginning reading. Elem. Eng., April, 1963, 40, 415-419.

Frostig, Marianne. Education of children with learning difficulties. A reprint from Distinguished lectures in special education. Univer. of So. Calif., Summer session, 1962.

Frostig, Marianne. Visual perception in the brain-injured child. Amer. J. Orthopsychiat., July, 1963, 33, 665-671.

Frostig, Marianne, & Horne, D. The Frostig program for the development of visual perception. Chicago, Ill.: Follett, 1964.

Frostig, Marianne, Lefever, W., & Whittlesey, J. Administration manual for Marianne Frostig developmental test of visual perception. (3rd ed.), Palo Alto, Calif.: Consulting Psychologists Press, Revised 1961.

Frostig, Marianne, Lefever, W., & Whittlesey, J. Disturbances in visual perception. J. educ. Res., Nov., 1963, 57, 160-162.

Gates, A. I. The psychology of reading and spelling. Teach. Coll. Contr. Educ., Columbia Univ., New York, 1922, No. 129.

Gibson, Eleanor J. Improvement in perceptual judgments as a function of controlled practice or training. Psychol. Bull., 1953, 50, 401-431.

Gibson, Eleanor J., & Walk, R. D. The 'visual cliff.' Scientif. Amer., April, 1960, 202 (4), 64-71.

Hammond, Sarah L., & Skipper, Dora S. Factors involved in the adjustment of children entering first grade. J. educ. Res., Oct., 1962, 56 (2), 89-95.

Hebb, D. O. The organization of behavior. New York: John Wiley & Sons, Inc., 1949.

Heller, Theodora M. Word-blindness -- a survey of the literature and a report of twenty-eight cases. Pediatrics, April, 1963, 31 (4), 669-691.

Hincks, Elizabeth M. Disability in reading and its relation to personality. Harvard Monogr. Educ., 1926, 2, No. 2 (1).

Hobson, J. R. Review of the Lee-Clark reading readiness test. In Oscar K. Buros The Fifth ment. Measmt. Yearb. Highland Park, New Jersey: Gryphon Press, 1959.

Hunt, J. McV. Intelligence and experience. New York: Ronald Press, 1961.

Jackson, E. Developmental alexia (congenital word blindness). Amer. J. med. Sci., May, 1906, 131 (5), 843-849.

James, W. The principles of psychology. Vol. 2. New York: Henry Holt & Co., 1890.

Kephart, N. The slow learner in the classroom. Columbus, Ohio: Charles E. Merrill, 1960.

Kingsley, H., & Garry, R. The nature and conditions of learning. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1957.

Kirk, S. A., & Bateman, Barbara. Diagnosis and remediation of learning disabilities. Except. Child., Oct., 1962, 29, 73-78.

Ladd, G. T. Elements of physiological psychology. Charles Scribner's Sons, 1897.

Lee, J. M., & Clark, W. W. Manual, Lee-Clark reading readiness test, kindergarten and grade 1. 1962 Revision. Monterey, Calif.: Calif. Test Bureau, Del Monte Research Park, 1962.

Lee, J. M., & Clark, W. W. Lee-Clark reading readiness test. Monterey, Calif.: Calif. Test Bureau, Del Monte Research Park, 1964 Catalog Standardized Tests.

Lehtinen, Laura. Have you ever known a perceptually handicapped child? Los Angeles: A report published by the Calif. Assoc. for Neurologically Handicapped Children, 1963.

Lewis, R. S., Strauss, A., & Lehtinen, Laura E. The other child: the brain injured child. New York: Grune & Stratton, 1951.

Lindquist, E. F. Design and analysis of experiments in psychology and education. Boston: Houghton Mifflin Co., 1956.

Lippman, H. S. Treatment of the child in emotional conflict. New York: McGraw-Hill, 1962.

Lord, Elizabeth, Carmichael, L., & Dearborn, W. Special disabilities in learning to read and write. Stud. educ. Psychol. educ. Measmt., The Graduate School of Education, Harvard University, June, 1925, 2, No. 1 (1).

Lowder, R. G. Perceptual ability and school achievement. A doctoral thesis (available for $2.00 from the Eyesight Conservation Committee, Winterhaven Lions Club, Winterhaven, Florida). Purdue University, 1956.

Lyons, C. V., & Lyons, Emily B. The power of visual training as measured in factors of intelligence. Reprint of the J. Amer. Opt. Assn., Dec., 1954, 255-262.

Lyons, C. V., & Lyons, Emily B. The power of visual training, part II, further case studies measured in factors of intelligence. Reprint from J. Amer. Opt. Assn., Nov., 1956, 28 (4), 217-226.

Lyons, C. V., & Lyons, Emily B. The power of optometric visual training, part III, a loom for productive thinking. Reprint from J. Amer. Opt. Assn., June, 1957, 38 (11), 649-655.

Lyons, C. V., & Lyons, Emily B. The power of optometric visual training, part IV, to build minds. Reprint from J. Amer. Opt. Assn., June, 1961, 32 (11), 879-885.

McBeath, Marcia. The effect of pretest interaction on a perceptual task. Calif. J. educ. Res., in press.

McBroom, Maude. Handling of reading disabilities. The Nation's Sch., June, 1946, 37 (6), 47-48.

McCready, E. B. Congenital word blindness as a cause of backwardness in school children, report of a case associated with stuttering. Penn. med. J., Jan., 1910, 13 (4), 278-284.

MacPherson, K. H. Personal communication. June, 1964.

Medinnus, G. R. The development of a first grade adjustment scale. J. exp. Educ., Dec., 1961, 30 (2), 243-248.

Money, J. Reading disability, progress and research needs in dyslexia. Baltimore: The Johns Hopkins Press, 1962.

Monroe, Marion. Children who cannot read. Chicago, Ill.: The University of Chicago Press, 1932, 1936.

Morgan, C. T. Physiological psychology. New York: McGraw-Hill, 1965.

Optometric Extension Program Seminar Staff. Section on Optometric Child Care and Guidance -- pamphlet. A brighter way of life for all children. Duncan, Oklahoma: 1961.

Orton, S. T. Foreward to study by Marion Monroe, Method for diagnosis and treatment of cases of reading disability. Genet. Psychol. Monogr., Oct.-Nov., 1928, 4, Nos. 4 & 5, 335-339.

Orton, S. T. Reading, writing and speech problems in children. New York: W. W. Norton & Co., Inc., 1937.

Piaget, J., & Inhelder, B. The child's conception of space. London: Routledge & Kegan Paul, 1956.

Radler, D. H., & Kephart, N. C. Success through play. New York: Harper & Bros., 1960.

Reeder, R. The historical development of school readers and of methods in teaching reading. New York: The Macmillan Co., 1900.

Remmers, H. H. Rating methods in research on teaching. In N. L. Gage (Ed.), Handbook of research on teaching. Chicago: Rand-McNally & Co., 1963.

Rice, A. Rhythmic training and body balancing prepare child for formal learning. The Nation's Sch., Feb., 1962.

Robinson, Helen. Treatment of severe cases of reading disability. J. educ. Res., March, 1939, 32, 531-535.

Russell, D. Children's thinking. Boston: Ginn & Co., 1956.

Sanford, E. A laboratory course in physiological psychology, monocular perception of space. Amer. J. Psychol., April, 1896, 7 (3), 412-424.

Sears, R. R., Maccoby, Eleanor E., & Levin, H. Patterns of child rearing. Evanston, Ill.: Row, Peterson Co., 1957.

Schmitt, Clara. Developmental alexia: congenital word-blindness, or inability to learn to read. Elem. Sch. J., June, 1918, 18 (9&10), 680-700, 757-769.

Smith, K. U., & Smith, W. M. Perception and motion, an analysis of space structured behavior. Philadelphia & London: W. B. Saunders, Co., 1962.

Solomon, R. An extension of control group design. Psychol. Bull., 1949, 46, 137-150.

Spache, G. D. Procedure manual: template procedure. Winterhaven, Florida: The Star Press, 1963.

Stuart, Marion F. Neurophysiological insights into teaching. Palo Alto, Calif.: Pacific Books, 1963.

Sullivan, Elizabeth, Clark, W., & Tiegs. California short-form test of mental maturity manual. Monterey, Calif.: Calif. Test Bureau, Del Monte Research Park, 1957.

Taylor, E. A. Controlled reading. Chicago, Ill.: University of Chicago Press, 1937.

Taylor, J. G. The behavioral basis of perception. New Haven & London: Yale University Press, 1962.

Tomkins, C. A reporter at large. The last skill acquired. The New Yorker, Sept. 14, 1963, 127-157.

Ulich, R. (Ed.). Three thousand years of educational widsom. Cambridge, Mass.: Harvard University Press, 1954.

Walker, Helen M., & Lev. J. Statistical inference. New York: Holt, Rinehart & Winston, 1953.

Wallace, M. (News Analyst) in a T.V. newscast on C.B.S. at 9:00 A.M. (P.S.T.), Dec. 17, 1963.

Wechsler, D. WISC manual -- intelligence scale for children. New York: The Psychological Corp., 1949.

Wheeler, L. R., & Wheeler, Viola D. Dyslexaphoria: symptoms and remedial suggestions. Elem. Eng., 1955, 32, 305-311.

Zangwill, O. L. Dyslexia in relation to cerebral dominance. In John Money's Reading disability, progress and research needs in dyslexia. Baltimore: The Johns Hopkins Press, 1962.

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